Physical Environment Supporting Documentation

This document records the input parameters, assumptions and results of the models used in the soils and hydrology effects analysis in the Lower Joseph Creek Restoration Project (LJCRP) Environmental Impact Statement. This document is not intended to stand alone as a comprehensive resource specialist report. Please refer to the Physical Environment sections of the LJCRP Environmental Impact Statement for all discussions regarding the purpose and need, proposed action, existing condition and analysis of effects.

Site Specific Riparian Habitat Conservation Area Thinning Sediment Delivery Potential Analysis

Model Used:

WEPP Hillslope/Watershed Model (Windows Interface, Version – September 17, 2012)
Developed by: USDA – Agriculture Research Service, National Soil Erosion Research Laboratory and Purdue University

Input Parameters:

This model was used to evaluate several sites within the LJCRP analysis area to support internal discussions and discussions with members of the public, the tribes and collaborative groups. Dozens of these scenarios were analyzed across the project area before a generic scenario based approach was adopted to characterize the effects across the range of Category 4 RHCA thinning.

Sumac Creek Site Specific Example:

- Analysis Site: Sumac Creek Field Trip Location
- Unit ID: 117
- Slope: 50% (based on steepest part of 117, measured through a digital elevation model)
- Shape: Concave (based on measured slope profile, validated in the field)
- Weather Parameters: 50 year statistical composite weather stream from the Wallowa weather station
- Soils: Klickson-Larabee (40% Klickson) from 2013 SURRGO (OR-631) This map unit complex characterizes the soils in the portion of Unit 117 in the RHCA.
- Disturbance: 2 year Forest Management - To generate a worst case scenario, I assumed that the erosive effects of timber harvest would persist for up to 2 years. Based on field observations and professional judgment, ground cover is typically restored in less than 6 months.
- The model assumes mechanized timber harvest but the unit would be harvested using a partial suspension skyline system. Mechanized timber harvest would increase the erosive potential for the analysis area compared to skyline harvesting and thus would also help characterize a worst-case scenario.
- The model assumes that there is no harvest buffer.

Results

Most of the erosion occurred at the streambank (Figure 1). The total amount of sediment delivered to the stream over 1 acre in this scenario was modeled at .012 metric tons or approximately 25 pounds (about a 5 gallon bucket). However, as part of the proposed action we are designing 25 foot buffers, in which nearly all of the erosion occurred.

2-Year Simulation	Value	Units
Average Annual Precipitation	17.07	in
Average Annual Runoff	0.30	in
Average Annual Soil Loss	0.012	ton/ac
Average Annual Sediment Yield	0.011	ton/ac

Table 1: Model Outputs for the Sumac Creek Site Example

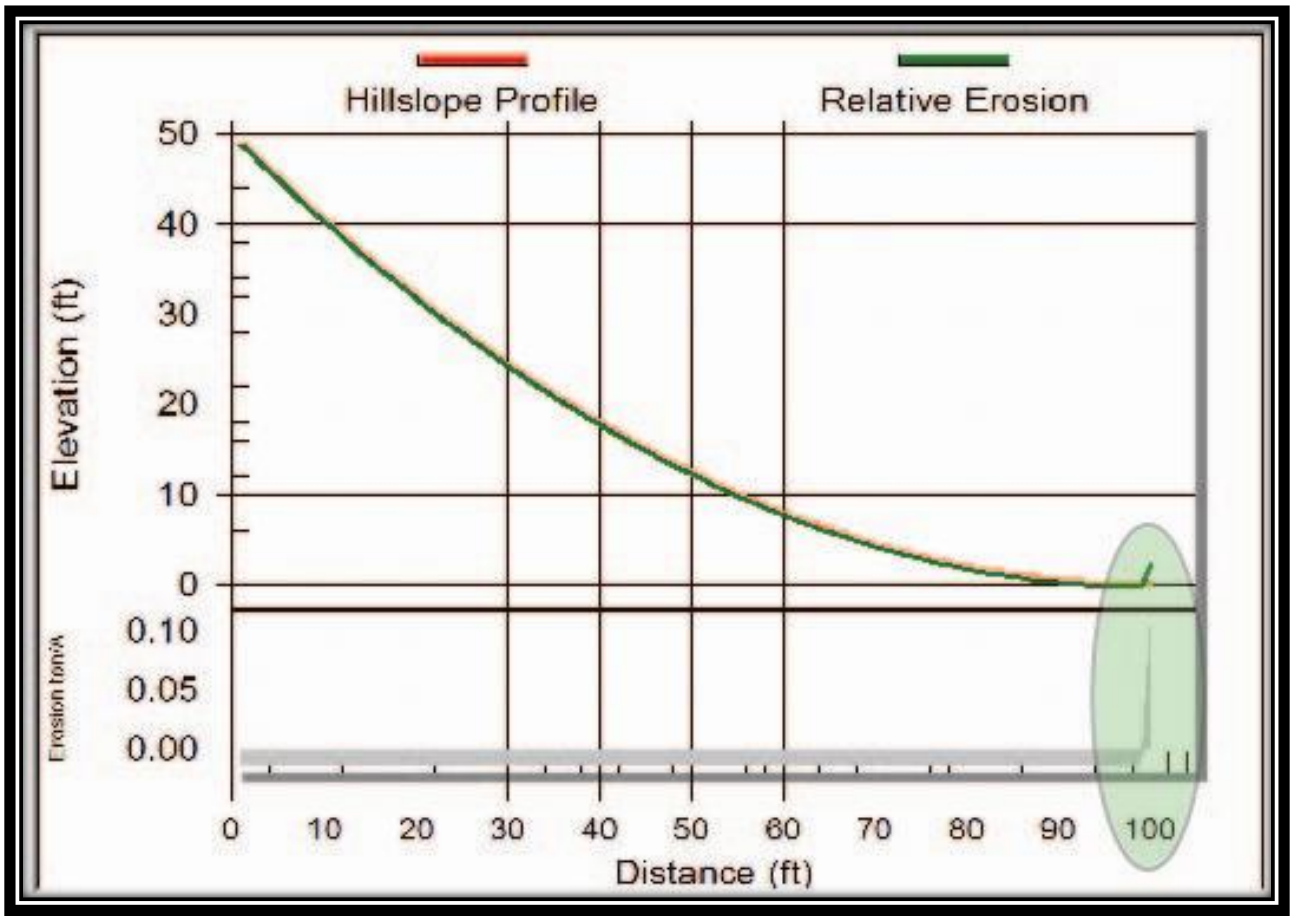

Figure 1: WEPP profile analysis of the Sumac Creek Site Example. The area highlighted in green indicates the point along the profile where the vast majority of the erosion occurred. On the X-axis, 0 indicates the edge of the RHCA and 100 indicates the location of the stream channel.

Conclusion

At the Sumac Creek site, modeling indicated that vegetation management activities in this scenario are unlikely to deliver a significant amount of sediment to the stream channel. It also highlighted the importance of protecting the integrity of the channel. Dozens of sites across the LJCRP analysis area were modeled and produced similar results. However, we felt that a generic scenario based model would better characterize the effects of RHCA harvest for all situations proposed in Alternative 2.

Scenario Based Riparian Habitat Conservation Area Thinning Sediment Delivery Potential Analysis

Model Used:

WEPP Hillslope/Watershed Model (Windows Interface, Version – September 17, 2012)
Developed by: USDA – Agriculture Research Service, National Soil Erosion Research Laboratory and Purdue University

Input Parameters:

This model was used to run a variety of scenarios that evaluated the effects of harvest activities in and adjacent to Riparian Habitat Conservation Areas. This method was developed by Jim Archuleta, Soil Scientist on the Umatilla National Forest, to characterize the effect of slope and soil texture in and adjacent to the RHCA on sediment delivery potential. Additionally, effective ground cover was modeled under harvest scenarios with and without skid trails and wildfire.

Results

WEPP Run Combo	Soil Textures (Loam = L or Silt Loam=SiL)	Upper Element = Harvest Treatment cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Upper Gradient (%) 1	Upper Gradient (%) 2	Upper Horizontal Length (ft.)	Upper Cover (%)	Upper Rock (%)	Lower Element = stream Buffer cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Lower Gradient (%) 1	Lower Gradient (%) 2	Lower Horizontal Length (ft.)	Lower Cover (%)	Lower Rock (%)	Delivery (30 years) t/ac	Probability of delivery	Delivery Average t/ac	Activity Cleared = if (Delivery Avg (t/ac) <0.03t/ac, True = "Harvest or Trail", False = "No Harvest or No Trail")
Harvest Scenario (Loam Texture)																	
1	L	PG	60	60	1150	40	10	MF	40	5	50	100	10	0.0041	10%	0.0000	Harvest
2	L	PG	60	60	1175	40	10	MF	40	5	25	100	10	0.0371	10%	0.0000	Harvest
3	L	PG	60	60	1195	40	10	MF	40	5	5	100	10	0.1764	10%	0.0044	Harvest
4	L	PG	60	60	1150	40	10	MF	50	5	50	100	10	0.0054	10%	0.0000	Harvest
5	L	PG	60	60	1175	40	10	MF	50	5	25	100	10	0.0453	10%	0.0000	Harvest
6	L	PG	60	60	1195	40	10	MF	50	5	5	100	10	0.1896	10%	0.0089	Harvest
7	L	PG	60	60	1150	40	10	MF	60	5	50	100	10	0.0070	10%	0.0000	Harvest
8	L	PG	60	60	1175	40	10	MF	60	5	25	100	10	0.0546	10%	0.0000	Harvest
9	L	PG	60	60	1195	40	10	MF	60	5	5	100	10	0.2030	10%	0.0089	Harvest
10	L	MF	60	60	1150	100	10	MF	40	5	50	100	10	0.0000	0%	0.0000	Harvest
11	L	MF	60	60	1150	100	10	MF	50	5	50	100	10	0.0000	0%	0.0000	Harvest
12	L	MF	60	60	1150	100	10	MF	60	5	50	100	10	0.0000	0%	0.0000	Harvest
Harvest Scenario (Silt Loam Texture)																	
1	SiL	PG	60	60	1150	40	10	MF	40	5	50	100	10	0.0217	10%	0.0000	Harvest
2	SiL	PG	60	60	1175	40	10	MF	40	5	25	100	10	0.1058	13%	0.0044	Harvest
3	SiL	PG	60	60	1195	40	10	MF	40	5	5	100	10	0.4002	13%	0.0133	Harvest
4	SiL	PG	60	60	1150	40	10	MF	50	5	50	100	10	0.0276	10%	0.0000	Harvest
5	SiL	PG	60	60	1175	40	10	MF	50	5	25	100	10	0.1237	13%	0.0044	Harvest
6	SiL	PG	60	60	1195	40	10	MF	50	5	5	100	10	0.4302	13%	0.0178	Harvest
7	SiL	PG	60	60	1150	40	10	MF	60	5	50	100	10	0.0344	10%	0.0000	Harvest

WEPP Run Combo	Soil Textures (Loam = L or Silt Loam=SiL)	Upper Element = Harvest Treatment cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Upper Gradient (%) 1	Upper Gradient (%) 2	Upper Horizontal Length (ft.)	Upper Cover (%)	Upper Rock (%)	Lower Element = stream Buffer cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Lower Gradient (%) 1	Lower Gradient (%) 2	Lower Horizontal Length (ft.)	Lower Cover (%)	Lower Rock (%)	Delivery (30 years) t/ac	Probability of delivery	Delivery Average t/ac	Activity Cleared = if (Delivery Avg (t/ac) <0.03t/ac, True = "Harvest or Trail", False = "No Harvest or No Trail")
8	SiL	PG	60	60	1175	40	10	MF	60	5	25	100	10	0.1433	13%	0.0044	Harvest
9	SiL	PG	60	60	1195	40	10	MF	60	5	5	100	10	0.4576	13%	0.0178	Harvest
10	SiL	MF	60	60	1150	100	10	MF	40	5	50	100	10	0.0817	3%	0.0044	Harvest
11	SiL	MF	60	60	1150	100	10	MF	50	5	50	100	10	0.0867	3%	0.0044	Harvest
12	SiL	MF	60	60	1150	100	10	MF	60	5	50	100	10	0.0911	3%	0.0044	Harvest
Skid Trail Scenario (Loam Texture)																	
1	L	ST	35	35	695	10	10	MF	10	5	5	100	10	5.9933	67%	0.6853	No Trail
2	L	ST	35	35	675	10	10	MF	10	5	25	100	10	4.1021	43%	0.2359	No Trail
3	L	ST	35	35	650	10	10	MF	10	5	50	100	10	2.3890	30%	0.0979	No Trail
4	L	ST	35	35	625	10	10	MF	10	5	75	100	10	1.0487	20%	0.0490	No Trail
5	L	ST	35	35	600	10	10	MF	10	5	100	100	10	0.3225	10%	0.0133	Trail
6	L	ST	35	35	695	10	10	MF	20	5	5	100	10	6.3718	67%	0.7877	No Trail
7	L	ST	35	35	675	10	10	MF	20	5	25	100	10	4.8406	43%	0.3204	No Trail
8	L	ST	35	35	650	10	10	MF	20	5	50	100	10	3.3814	33%	0.1602	No Trail
9	L	ST	35	35	625	10	10	MF	20	5	75	100	10	1.8463	20%	0.0757	No Trail
10	L	ST	35	35	600	10	10	MF	20	5	100	100	10	0.6310	13%	0.0267	Trail
11	L	ST	35	35	695	10	10	MF	30	5	5	100	10	6.6234	67%	0.8678	No Trail
12	L	ST	35	35	675	10	10	MF	30	5	25	100	10	5.9022	53%	0.4094	No Trail
13	L	ST	35	35	650	10	10	MF	30	5	50	100	10	3.9053	40%	0.2047	No Trail
14	L	ST	35	35	625	10	10	MF	30	5	75	100	10	2.5804	33%	0.1290	No Trail
15	L	ST	35	35	600	10	10	MF	30	5	100	100	10	1.0186	17%	0.0401	No Trail
16	L	ST	35	35	695	10	10	MF	40	5	5	100	10	6.8552	67%	0.9389	No Trail
17	L	ST	35	35	675	10	10	MF	40	5	25	100	10	6.4480	57%	0.4984	No Trail
18	L	ST	35	35	650	10	10	MF	40	5	50	100	10	4.5536	40%	0.2536	No Trail
19	L	ST	35	35	625	10	10	MF	40	5	75	100	10	3.2448	33%	0.1646	No Trail
20	L	ST	35	35	600	10	10	MF	40	5	100	100	10	1.3901	20%	0.0623	No Trail
21	L	ST	35	35	295	10	10	MF	10	5	5	100	10	2.9056	67%	0.3782	No Trail
22	L	ST	35	35	275	10	10	MF	10	5	25	100	10	1.6852	27%	0.0890	No Trail
23	L	ST	35	35	250	10	10	MF	10	5	50	100	10	0.2535	10%	0.0089	Trail
24	L	ST	35	35	225	10	10	MF	10	5	75	100	10	0.0224	3%	0.0000	Trail
25	L	ST	35	35	200	10	10	MF	10	5	100	100	10	0.0000	0%	0.0000	Trail
26	L	ST	35	35	295	10	10	MF	20	5	5	100	10	3.1205	67%	0.4316	No Trail
27	L	ST	35	35	275	10	10	MF	20	5	25	100	10	2.1688	33%	0.1379	No Trail
28	L	ST	35	35	250	10	10	MF	20	5	50	100	10	0.4160	10%	0.0178	Trail
29	L	ST	35	35	225	10	10	MF	20	5	75	100	10	0.0549	7%	0.0044	Trail
30	L	ST	35	35	200	10	10	MF	20	5	100	100	10	0.0000	0%	0.0000	Trail
31	L	ST	35	35	295	10	10	MF	30	5	5	100	10	3.2224	67%	0.4673	No Trail
32	L	ST	35	35	275	10	10	MF	30	5	25	100	10	2.3890	37%	0.1602	No Trail
33	L	ST	35	35	250	10	10	MF	30	5	50	100	10	0.9046	17%	0.0401	No Trail
34	L	ST	35	35	225	10	10	MF	30	5	75	100	10	0.1411	10%	0.0089	Trail
35	L	ST	35	35	200	10	10	MF	30	5	100	100	10	0.0788	7%	0.0044	Trail
36	L	ST	35	35	295	10	10	MF	40	5	5	100	10	3.3450	67%	0.4895	No Trail
37	L	ST	35	35	275	10	10	MF	40	5	25	100	10	2.5791	37%	0.1869	No Trail
38	L	ST	35	35	250	10	10	MF	40	5	50	100	10	1.1175	17%	0.0490	No Trail
39	L	ST	35	35	225	10	10	MF	40	5	75	100	10	0.1767	10%	0.0133	Trail
40	L	ST	35	35	200	10	10	MF	40	5	100	100	10	0.0899	7%	0.0044	Trail
41	L	MF	35	35	695	100	10	MF	10	5	5	100	10	0.0000	0%	0.0000	Trail
42	L	MF	35	35	695	100	10	MF	20	5	5	100	10	0.0000	0%	0.0000	Trail
43	L	MF	35	35	695	100	10	MF	30	5	5	100	10	0.0000	0%	0.0000	Trail
44	L	MF	35	35	695	100	10	MF	40	5	5	100	10	0.0000	0%	0.0000	Trail
45	L	MF	35	35	695	100	10	MF	50	5	5	100	10	0.0000	0%	0.0000	Trail
46	L	MF	35	35	695	100	10	MF	60	5	5	100	10	0.0000	0%	0.0000	Trail
47	L	MF	35	35	295	100	10	MF	10	5	5	100	10	0.0000	0%	0.0000	Trail
48	L	MF	35	35	295	100	10	MF	20	5	5	100	10	0.0000	0%	0.0000	Trail
49	L	MF	35	35	295	100	10	MF	30	5	5	100	10	0.0000	0%	0.0000	Trail
50	L	MF	35	35	295	100	10	MF	40	5	5	100	10	0.0000	0%	0.0000	Trail
51	L	MF	35	35	295	100	10	MF	50	5	5	100	10	0.0000	0%	0.0000	Trail
52	L	MF	35	35	295	100	10	MF	60	5	5	100	10	0.0000	0%	0.0000	Trail
Skid Trail Scenario (Silt Loam Texture)																	
1	SiL	ST	35	35	695	10	10	MF	10	5	5	100	10	6.3423	33%	0.4717	No Trail
2	SiL	ST	35	35	675	10	10	MF	10	5	25	100	10	3.5352	27%	0.1646	No Trail
3	SiL	ST	35	35	650	10	10	MF	10	5	50	100	10	1.1478	20%	0.0490	No Trail
4	SiL	ST	35	35	625	10	10	MF	10	5	75	100	10	0.5022	13%	0.0223	Trail
5	SiL	ST	35	35	600	10	10	MF	10	5	100	100	10	0.3458	10%	0.0133	Trail
6	SiL	ST	35	35	695	10	10	MF	20	5	5	100	10	6.3423	33%	0.4717	No Trail

WEPP Run Combo	Soil Textures (Loam = L or Silt Loam=SiL)	Upper Element = Harvest Treatment cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Upper Gradient (%) 1	Upper Gradient (%) 2	Upper Horizontal Length (ft.)	Upper Cover (%)	Upper Rock (%)	Lower Element = stream Buffer cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Lower Gradient (%) 1	Lower Gradient (%) 2	Lower Horizontal Length (ft.)	Lower Cover (%)	Lower Rock (%)	Delivery (30 years) t/ac	Probability of delivery	Delivery Average t/ac	Activity Cleared = if (Delivery Avg (t/ac) <0.03t/ac, True = "Harvest or Trail", False = "No Harvest or No Trail")
7	SiL	ST	35	35	675	10	10	MF	20	5	25	100	10	3.5352	27%	0.1646	No Trail
8	SiL	ST	35	35	650	10	10	MF	20	5	50	100	10	1.1478	20%	0.0490	No Trail
9	SiL	ST	35	35	625	10	10	MF	20	5	75	100	10	0.5022	13%	0.0223	Trail
10	SiL	ST	35	35	600	10	10	MF	20	5	100	100	10	0.3458	10%	0.0133	Trail
11	SiL	ST	35	35	695	10	10	MF	30	5	5	100	10	6.3423	33%	0.4717	No Trail
12	SiL	ST	35	35	675	10	10	MF	30	5	25	100	10	3.5352	27%	0.1646	No Trail
13	SiL	ST	35	35	650	10	10	MF	30	5	50	100	10	1.1478	20%	0.0490	No Trail
14	SiL	ST	35	35	625	10	10	MF	30	5	75	100	10	0.5022	13%	0.0233	Trail
15	SiL	ST	35	35	600	10	10	MF	30	5	100	100	10	0.3458	10%	0.0133	Trail
16	SiL	ST	35	35	695	10	10	MF	40	5	5	100	10	6.3423	33%	0.4717	No Trail
17	SiL	ST	35	35	675	10	10	MF	40	5	25	100	10	3.5352	27%	0.1646	No Trail
18	SiL	ST	35	35	650	10	10	MF	40	5	50	100	10	1.1478	20%	0.0490	No Trail
19	SiL	ST	35	35	625	10	10	MF	40	5	75	100	10	0.5022	13%	0.0223	Trail
20	SiL	ST	35	35	600	10	10	MF	40	5	100	100	10	0.3458	10%	0.0133	Trail
21	SiL	ST	35	35	295	10	10	MF	10	5	5	100	10	3.1809	33%	0.2536	No Trail
22	SiL	ST	35	35	275	10	10	MF	10	5	25	100	10	1.2597	17%	0.0623	No Trail
23	SiL	ST	35	35	250	10	10	MF	10	5	50	100	10	0.2697	7%	0.0089	Trail
24	SiL	ST	35	35	225	10	10	MF	10	5	75	100	10	0.0056	3%	0.0000	Trail
25	SiL	ST	35	35	200	10	10	MF	10	5	100	100	10	0.0000	0%	0.0000	Trail
26	SiL	ST	35	35	295	10	10	MF	20	5	5	100	10	3.4848	33%	0.2982	No Trail
27	SiL	ST	35	35	275	10	10	MF	20	5	25	100	10	1.8914	17%	0.0890	No Trail
28	SiL	ST	35	35	250	10	10	MF	20	5	50	100	10	0.5614	10%	0.0267	Trail
29	SiL	ST	35	35	225	10	10	MF	20	5	75	100	10	0.0104	3%	0.0000	Trail
30	SiL	ST	35	35	200	10	10	MF	20	5	100	100	10	0.0000	0%	0.0000	Trail
31	SiL	ST	35	35	295	10	10	MF	30	5	5	100	10	3.6386	33%	0.3204	No Trail
32	SiL	ST	35	35	275	10	10	MF	30	5	25	100	10	2.2855	17%	0.1157	No Trail
33	SiL	ST	35	35	250	10	10	MF	30	5	50	100	10	0.7929	10%	0.0312	No Trail
34	SiL	ST	35	35	225	10	10	MF	30	5	75	100	10	0.0178	3%	0.0000	Trail
35	SiL	ST	35	35	200	10	10	MF	30	5	100	100	10	0.0000	0%	0.0000	Trail
36	SiL	ST	35	35	295	10	10	MF	40	5	5	100	10	3.7899	33%	0.3427	No Trail
37	SiL	ST	35	35	275	10	10	MF	40	5	25	100	10	2.4883	17%	0.1335	No Trail
38	SiL	ST	35	35	250	10	10	MF	40	5	50	100	10	0.9258	10%	0.0356	No Trail
39	SiL	ST	35	35	225	10	10	MF	40	5	75	100	10	0.0320	3%	0.0000	Trail
40	SiL	ST	35	35	200	10	10	MF	40	5	100	100	10	0.0000	0%	0.0000	Trail
41	SiL	MF	35	35	695	100	10	MF	10	5	5	100	10	0.0025	3%	0.0000	Trail
42	SiL	MF	35	35	695	100	10	MF	20	5	5	100	10	0.0078	3%	0.0000	Trail
43	SiL	MF	35	35	695	100	10	MF	30	5	5	100	10	0.0113	3%	0.0000	Trail
44	SiL	MF	35	35	695	100	10	MF	40	5	5	100	10	0.0163	3%	0.0000	Trail
45	SiL	MF	35	35	695	100	10	MF	50	5	5	100	10	0.0195	3%	0.0000	Trail
46	SiL	MF	35	35	695	100	10	MF	60	5	5	100	10	0.0234	3%	0.0000	Trail
47	SiL	MF	35	35	295	100	10	MF	10	5	5	100	10	0.0000	0%	0.0000	Trail
48	SiL	MF	35	35	295	100	10	MF	20	5	5	100	10	0.0000	0%	0.0000	Trail
49	SiL	MF	35	35	295	100	10	MF	30	5	5	100	10	0.0000	0%	0.0000	Trail
50	SiL	MF	35	35	295	100	10	MF	40	5	5	100	10	0.0001	3%	0.0000	Trail
51	SiL	MF	35	35	295	100	10	MF	50	5	5	100	10	0.0006	3%	0.0000	Trail
52	SiL	MF	35	35	295	100	10	MF	60	5	5	100	10	0.0017	3%	0.0000	Trail
Wildfire Harvest Scenario (Loam Texture)																	
1	L	PG	60	60	1150	40	10	HSF	40	5	50	100	10	0.3082	23%	0.0133	Harvest
2	L	PG	60	60	1175	40	10	HSF	40	5	25	100	10	0.3086	23%	0.0133	Harvest
3	L	PG	60	60	1195	40	10	HSF	40	5	5	100	10	0.3076	23%	0.0133	Harvest
4	L	PG	60	60	1150	40	10	HSF	50	5	50	100	10	0.3186	23%	0.0133	Harvest
5	L	PG	60	60	1175	40	10	HSF	50	5	25	100	10	0.3178	23%	0.0133	Harvest
6	L	PG	60	60	1195	40	10	HSF	50	5	5	100	10	0.3165	23%	0.0133	Harvest
7	L	PG	60	60	1150	40	10	HSF	60	5	50	100	10	0.3280	23%	0.0133	Harvest
8	L	PG	60	60	1175	40	10	HSF	60	5	25	100	10	0.3261	23%	0.0133	Harvest
9	L	PG	60	60	1195	40	10	HSF	60	5	5	100	10	0.3244	23%	0.0133	Harvest
Wildfire Harvest Scenario (Silt Loam)																	
1	SiL	PG	60	60	1150	40	10	HSF	40	5	50	45	10	0.1222	10%	0.0040	Harvest
2	SiL	PG	60	60	1175	40	10	HSF	40	5	25	45	10	0.1218	10%	0.0044	Harvest
3	SiL	PG	60	60	1195	40	10	HSF	40	5	5	45	10	0.1219	10%	0.0044	Harvest
4	SiL	PG	60	60	1150	40	10	HSF	50	5	50	45	10	0.1386	10%	0.0044	Harvest
5	SiL	PG	60	60	1175	40	10	HSF	50	5	25	45	10	0.1374	10%	0.0044	Harvest
6	SiL	PG	60	60	1195	40	10	HSF	50	5	5	45	10	0.1366	10%	0.0044	Harvest

WEPP Run Combo	Soil Textures (Loam = L or Silt Loam=SiL)	Upper Element = Harvest Treatment cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Upper Gradient (%) 1	Upper Gradient (%) 2	Upper Horizontal Length (ft.)	Upper Cover (%)	Upper Rock (%)	Lower Element = stream Buffer cover (PG = Poor Grass or 40% cover, MF = Mature Forest, or 100% cover ST = Skid Trail, or 10% cover HSF= High Severity Fire or 45% cover	Lower Gradient (%) 1	Lower Gradient (%) 2	Lower Horizontal Length (ft.)	Lower Cover (%)	Lower Rock (%)	Delivery (30 years) t/ac	Probability of delivery	Delivery Average t/ac	Activity Cleared = if (Delivery Avg (t/ac) <0.03t/ac, True = "Harvest or Trail", False = "No Harvest or No Trail")
7	SiL	PG	60	60	1150	40	10	HSF	60	5	50	45	10	0.1533	10%	0.0044	Harvest
8	SiL	PG	60	60	1175	40	10	HSF	60	5	25	45	10	0.1512	10%	0.0044	Harvest
9	SiL	PG	60	60	1195	40	10	HSF	60	5	5	45	10	0.1496	10%	0.0044	Harvest
Wildfire Skid Trail Scenario																	
1	L	ST	35	35	695	10	10	HSF	10	5	5	45	10	1.2553	57%	0.1290	No Trail
2	L	ST	35	35	675	10	10	HSF	10	5	25	45	10	1.2280	57%	0.1246	No Trail
3	L	ST	35	35	650	10	10	HSF	10	5	50	45	10	1.1986	53%	0.1202	No Trail
4	L	ST	35	35	625	10	10	HSF	10	5	75	45	10	1.1651	53%	0.1157	No Trail
5	L	ST	35	35	600	10	10	HSF	10	5	100	45	10	1.1144	50%	0.1113	No Trail
6	L	ST	35	35	575	10	10	HSF	20	5	125	45	10	1.0785	43%	0.1024	No Trail
7	L	ST	35	35	550	10	10	HSF	20	5	150	45	10	1.0527	43%	0.0979	No Trail
8	L	ST	35	35	525	10	10	HSF	20	5	175	45	10	1.8710	43%	0.0979	No Trail
9	L	ST	35	35	500	10	10	HSF	20	5	200	45	10	1.1247	40%	0.0979	No Trail
10	L	ST	35	35	475	10	10	HSF	20	5	225	45	10	0.9392	37%	0.0801	No Trail
11	L	ST	35	35	450	10	10	HSF	30	5	250	45	10	0.8771	37%	0.0712	No Trail
12	L	ST	35	35	425	10	10	HSF	30	5	275	45	10	0.8272	33%	0.0668	No Trail
13	L	ST	35	35	400	10	10	HSF	30	5	300	45	10	0.7429	33%	0.0623	No Trail
14	L	ST	35	35	375	10	10	HSF	30	5	325	45	10	0.6304	33%	0.0534	No Trail
15	L	ST	35	35	350	10	10	HSF	30	5	350	45	10	0.5203	30%	0.0490	No Trail
16	L	ST	35	35	325	10	10	HSF	40	5	375	45	10	0.4427	30%	0.0401	No Trail
17	L	ST	35	35	300	10	10	HSF	40	5	400	45	10	0.1700	23%	0.0089	Trail
Wildfire Skid Trail Scenario																	
1	SiL	ST	35	35	695	10	10	HSF	10	5	5	45	10	1.6918	40%	0.1068	No Trail
2	SiL	ST	35	35	675	10	10	HSF	10	5	25	45	10	1.6480	30%	0.1068	No Trail
3	SiL	ST	35	35	650	10	10	HSF	10	5	50	45	10	1.5839	30%	0.1068	No Trail
4	SiL	ST	35	35	625	10	10	HSF	10	5	75	45	10	1.5470	30%	0.0979	No Trail
5	SiL	ST	35	35	600	10	10	HSF	10	5	100	45	10	1.4861	27%	0.0934	No Trail
6	SiL	ST	35	35	575	10	10	HSF	20	5	125	45	10	1.4168	27%	0.0846	No Trail
7	SiL	ST	35	35	550	10	10	HSF	20	5	150	45	10	1.3446	27%	0.0757	No Trail
8	SiL	ST	35	35	525	10	10	HSF	20	5	175	45	10	1.1661	27%	0.0668	No Trail
9	SiL	ST	35	35	500	10	10	HSF	20	5	200	45	10	0.8696	27%	0.0534	No Trail
10	SiL	ST	35	35	475	10	10	HSF	20	5	225	45	10	0.7902	27%	0.0490	No Trail
11	SiL	ST	35	35	450	10	10	HSF	30	5	250	45	10	0.7011	27%	0.0445	No Trail
12	SiL	ST	35	35	425	10	10	HSF	30	5	275	45	10	0.6668	27%	0.0401	No Trail
13	SiL	ST	35	35	400	10	10	HSF	30	5	300	45	10	0.6415	27%	0.3560	No Trail
14	SiL	ST	35	35	375	10	10	HSF	30	5	325	45	10	0.5550	27%	0.0312	No Trail
15	SiL	ST	35	35	350	10	10	HSF	30	5	350	45	10	0.5220	23%	0.0312	No Trail
16	SiL	ST	35	35	325	10	10	HSF	40	5	375	45	10	0.4887	20%	0.0267	Trail

Conclusion

An evaluation of the sediment delivery potentials and probabilities of high volume delivery events (the weather stream captured the 1996-97 50-100 year water event) indicate a very low risk of sediment delivery under harvest only scenarios and harvest and wildfire only scenarios. Sediment delivery increases significantly in scenarios where skid trails were modeled on steep grounds inside the RHCA and adjacent to the RHCA. This information was translated into Project Design Criteria to prevent skid trails from being constructed in any of the high erosion potential scenarios. The direction from this project design extends beyond the RHCA boundaries to protect water resources.

General Road System Sediment Delivery Potential Analysis

Model Used:

Geomorphic Road Assessment and Inventory Package (GRAIP) – GIS interface GRAIP-Lite
Developed by: US Forest Service, Rocky Mountain Research Station

Input Parameters:

This model was used evaluate potential sediment production from forest roads within the LJCRP analysis area. A standard erosion base rate was used that characterizes the basalts of the eastern Oregon. A standard representative vegetation factor developed from the Umatilla River in Eastern Oregon was chosen, as it the most similar to the waterways in the analysis area. All of the roads in this portion of the analysis are system roads, so the maximum road slope of 15% was used. Site specific road information, such road maintenance level and surface type was derived from Forest Service cooperate roads data. This data provides the model information about usage and surface erodability.

Results

This analysis revealed generally very low sediment production for existing roads across the LJCRP analysis area. There are two portions of the project area, along three road systems (4600, 4602 and 4650) that indicate a higher sediment production potential (Figure 2).

Conclusion

Low predicted sediment yeilds within the project area are consistent with personal field observations and spatial analyses of the road system. Most of the roads are constructed on stable landforms with very little slope and a stable substrate. The roads that were identified as having higher potential for sediment delivery will be carefully evaluated for road maintenance and improvmenet opportunities prior to haul. These roads were constructed at slope breaks, mid-slopes and with drainage alignments that increase the potential for sediment delivery if the roads are inadquately maintained or constructed. The entire haul should receive all necessary maintenance to bring them up to standard for haul.

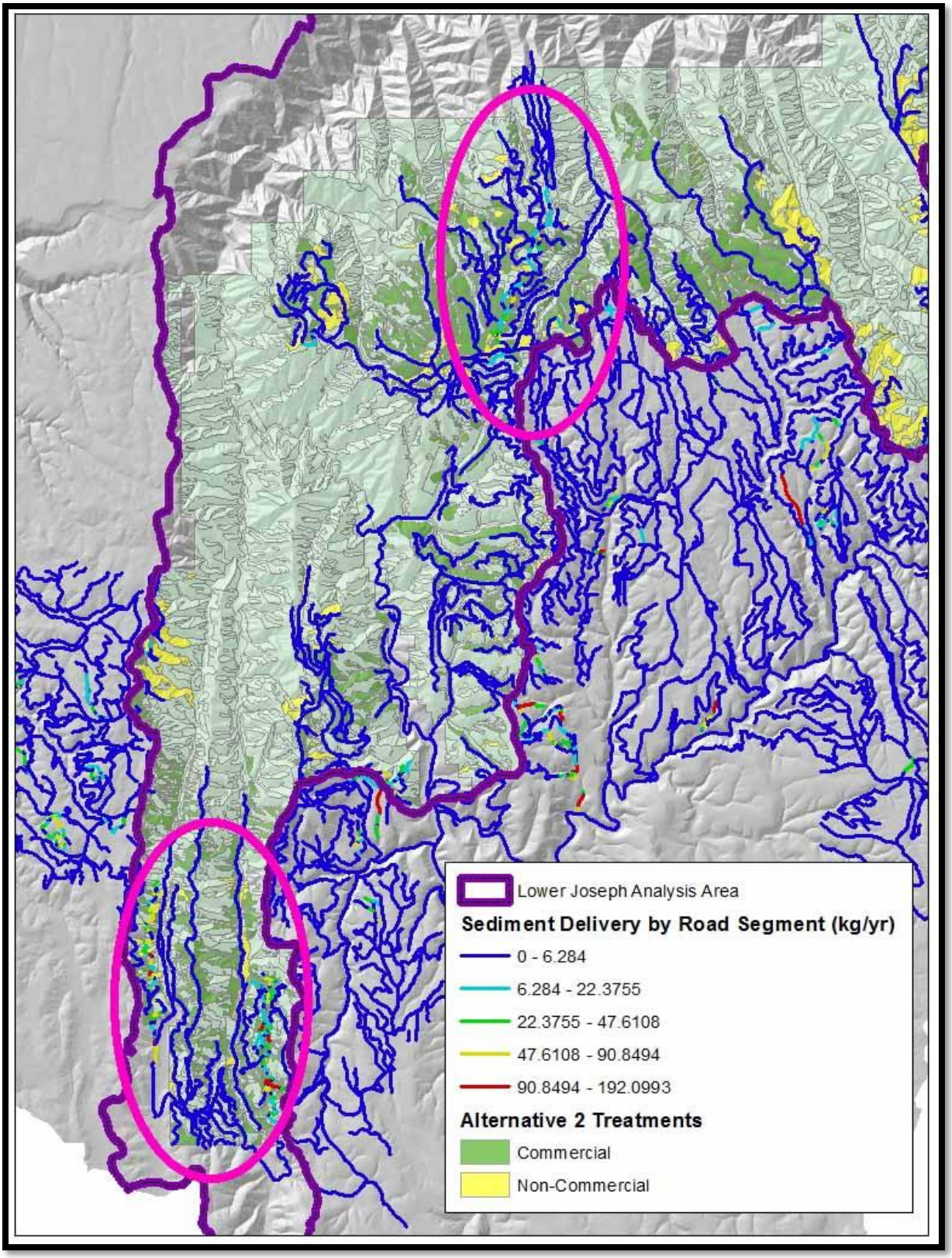

Figure 2: Results from GRAIP analysis indicating sediment delivery potential for the LJCRP road system. Areas highlighed in pink indicate road systems that have a higher potential for sediment delivery.

Haul System Sediment Delivery Potential Analysis

Model Used:

WEPP Roads Model (NETMAP Interface, Version – September 17, 2012)
Developed by: USDA – Agriculture Research Service, National Soil Erosion Research Laboratory and Purdue University

Input Parameters:

To provide a more targeted approach to identify sediment potential from haul activities I chose to use the WEPP Roads model instead of relying solely on GRAIPLite because I can more easily specify changes in traffic to the road system as a result of the proposed activities. After discussions with the Water Resource Specialist with the Nez Perce Tribe, I subset the roads data based on road surface type to more accurately characterize sediment delivery potential. Road maintenance level already takes this into account in the GRAIPLite model but GRAIPLite won't show increases in road use. Therefore a road surface composite WEPP Roads run should be the best way to characterize sediment delivery potential for each road segment during haul. This analysis is based on: outsloped, unrutted roads with a maximum road gradient of 12% because all system roads should be engineered. Three runs were aggregated based on the appropriate road surface information (native, gravel, paved) that was derived from the best available data. A soil type of "sandy loam with 20% rock fragments was selected because it characterizes the more erosive soils on average based on the 2013 soil survey inventories. A 50 year weather stream from Wallowa was used to characterize precipitation events. This weather stream included a 50-100 year high flow event in 1996-97.

Results

This analysis revealed two road systems, FS 4655 and FS portions of FS 4650 that may have a higher potential for sediment production (Figure 3). The GRAIPLite analysis also identified FS 4650 as a potential sediment problem. By subsetting the roads based on surface type, it also revealed that several small segments of low maintenance level roads may be at risk for increased sediment production during haul.

Conclusion

This analysis will inform road maintenance evaluations and work priorities prior to log haul so that we may minimize the amount of sediment delivered to streams from haul system roads during to implementation. It also stresses the importance of adequate road maintenance on low maintenance roads prior to haul. Sediment produced from the haul system, as modeled, would not likely have measurable affects at the watershed scale or even at the subwatershed scale. However, it is important to identify persistent sources of road sedimentation and do our best to mitigate those sources. Any increases in road sedimentation are unlikely to persist much beyond implementation. By improving the conditions of the road system and stream crossings for haul, overall sediment yield from the road system may likely decrease over the long term.

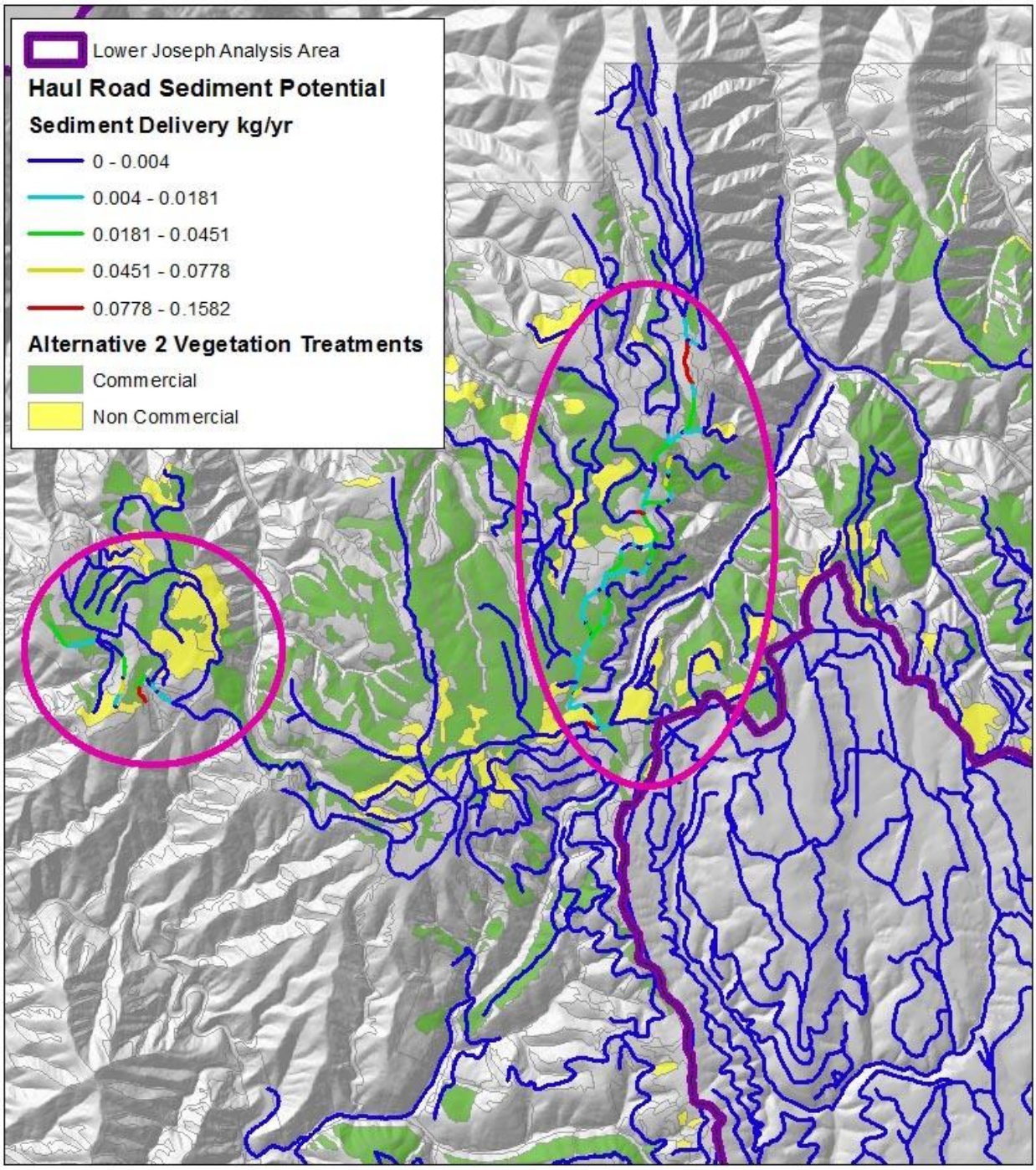

Figure 3: Potential sediment production from haul road system, highlighting FS 4650 and 4655 as having a higher sedimentation potential. Smaller lower maintenance level roads distributed across the whole project area also showed higher potential for sediment production

Temporary Road Sediment Delivery Potential Analysis

Model Used:

WEPP Hillslope/Watershed Model (NETMAP Interface, Version – September 17, 2012)
Developed by: USDA – Agriculture Research Service, National Soil Erosion Research Laboratory and Purdue University

Input Parameters:

The WEPP Roads model was chosen to help approximate the locations of temporary roads, inform Project Design Criteria that will guide any adjustments in their placement and to describe potential effects that pertain to sediment delivery. This analysis is based on: outsloped, unrutted roads with a maximum road gradient of 20% because temporary roads aren't as generally engineered as permanent system roads. Though some temporary roads are designed on existing non-system footprints with an aggregate substrate, to characterize a worse-case scenario, I assumed a native substrate for all temporary roads. A soil type of "sandy loam with 20% rock fragments was selected because it characterizes the more erosive soils on average based on the 2013 soil survey inventories. A 50 year weather stream from Wallowa was used to characterize precipitation events. This weather stream included a 50-100 year high flow event in 1996-97.

Results

This analysis revealed very low sediment production potential for most of the temporary road locations approximated in this analysis. This is largely due to temporary road placement in low gradient landscape positions and with desirable (poor) drainage alignment. Other factors that don't contribute to sediment delivery but were considered as part of temporary road design include wildlife habitat, invasive weeds, sensitive plants, sensitive soils and proximity to fish habitat. Three temporary roads were identified in the analysis as having a moderate to high potential for sediment delivery (Figure 4). This was due to improper drainage alignment and stream crossings. There are four stream crossings designed in four category 4 (intermittent) streams.

Conclusion

It's important to note that temporary road locations are only approximated in this analysis. Project Design Criteria and careful evaluation on the ground will guide their placement. Project Design Criteria will guide the implementing workforce to place temporary roads in the approximate locations identified in this analysis while meeting the intent of the specified design criteria. In the case of sediment delivery, temporary roads should not be designed in alignment with any drainage. Stream crossings should be designed at the lowest possible gradient, when the ground and channel are dry. The crossing should be used and remediated prior to the end of the dry season. Any area that is disturbed within 25 feet of the channel should have weed free mulch applied to it to mitigate erosion. In the areas identified for potential stream crossings, the implementing unit should evaluate alternatives for management that do not necessitate stream crossings providing the options are consistent with all other temporary road design criteria (See Appendix K).

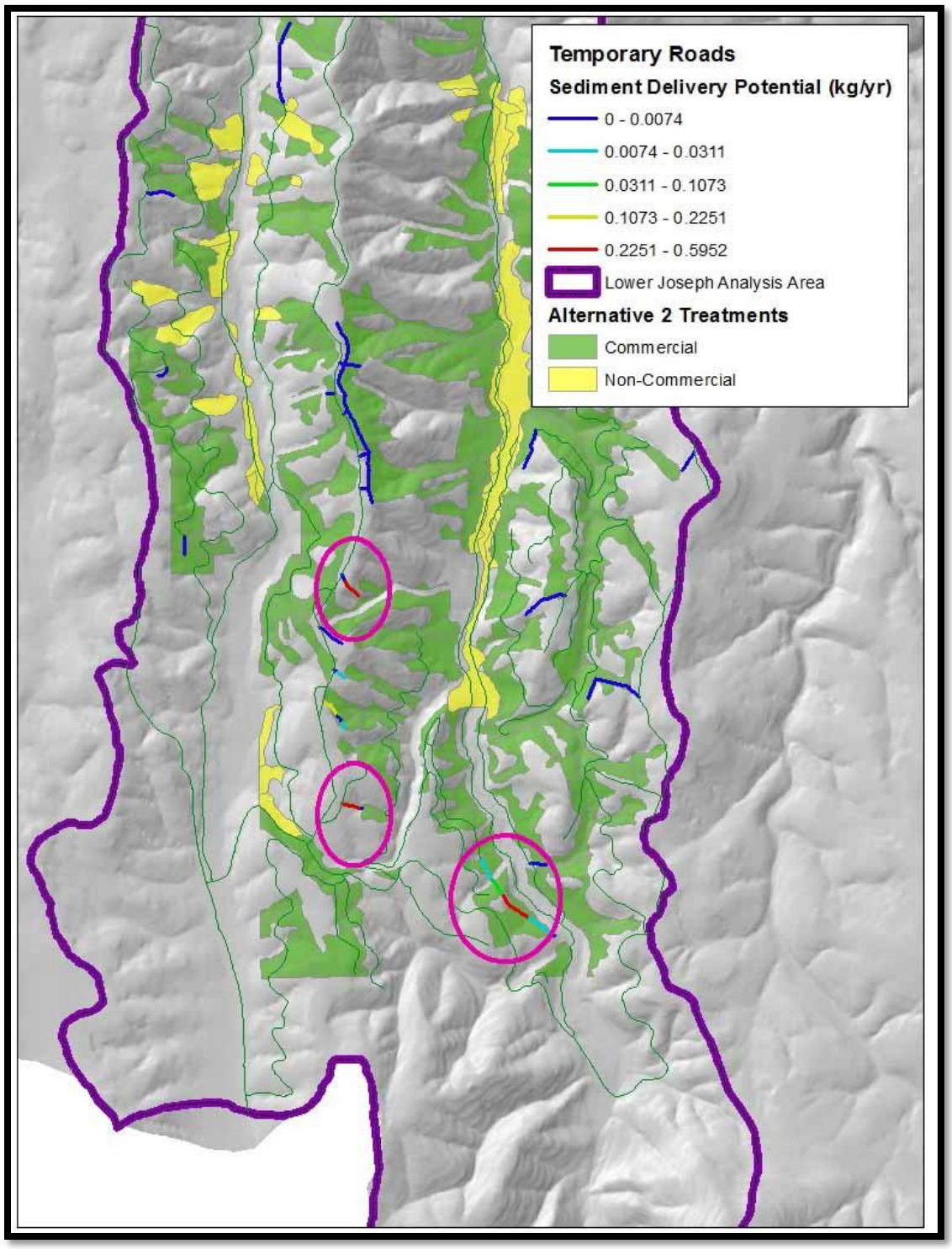

Figure 4: Results from WEPP Roads analysis indicating sediment delivery potential for the LJCRP temporary road system. Areas highlighed in pink indicate temporary roads that have a higher potential for sediment delivery. These locations are approximate and sediment related issues will be largely mitigated through Project Design Criteria.

Flood Plain Delineation Analysis

Model Used:

NETMAP Floodplain Mapping Tool

Input Parameters:

The NETMAP Floodplain Mapping Tool uses a 10 meter resolution Digital Elevation Model (DEM) and computes areas that would be inundated based on specified parameters of bankfull maximum multipliers or height above channel. Based on field observations and evaluation of channel morphology in the DEM, I selected a three times the bankfull maximum as the multiplier to characterize the floodplains.

Results

After evaluating several other user controlled variables I was most satisfied with the 3xbankfull to characterize floodplains. Generally, it overestimates the size of the floodplains but I found that if I used anything smaller, portions of other stream's floodplains weren't adequately captured. Therefore, 3xbankfull adequately characterizes the landscape's floodplains as a whole. See Figure 5 for an example of floodplain delineation along Swamp Creek.

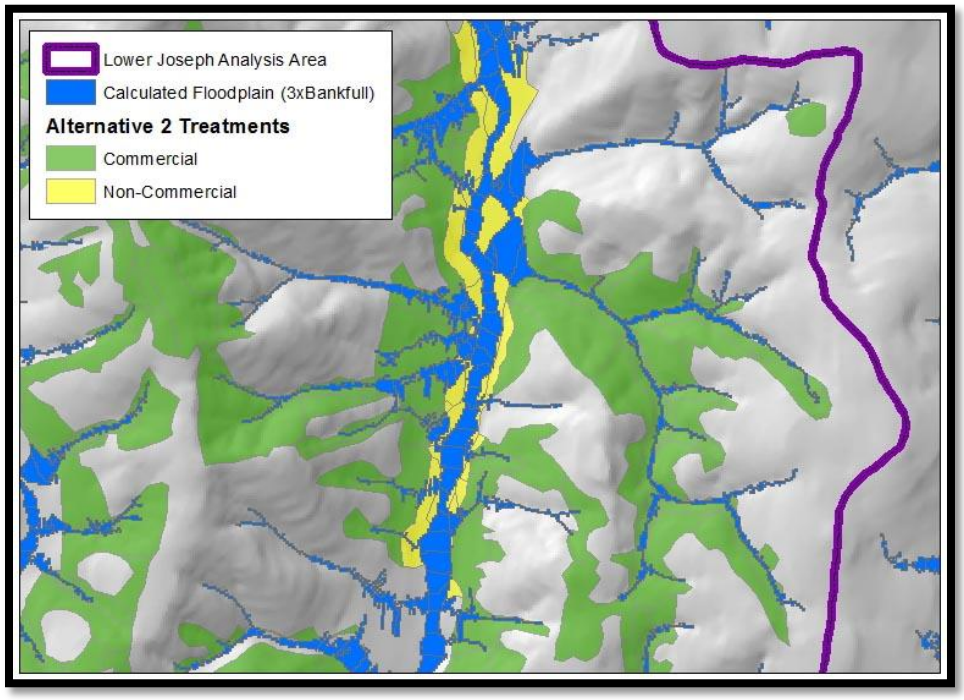

Figure 5: Example of floodplain calculation along Swamp Creek

Conclusion

The proposed treatments in both action alternatives will not have any adverse effect on the current function of any of the floodplains in the analysis area. 58 acres of vegetation management is proposed in Swamp Creek's historic floodplain under Alternative 2. Swamp Creek's floodplain is already very impaired due to channel incision and general loss of channel structure and complexity. The activities proposed are designed to restore forest structure, composition and pattern based on historic information. Restoring the other aspects of Swamp Creek's floodplain were not evaluated in this analysis.

Landslide Potential Analysis

Model Used:

Generic Erosion Prediction Model (Burnett and Miller, 2007), NETMAP Interface

Input Parameters:

To predict the potential for shallow landslides and gully erosion we used a topographic index called "Generic Erosion Potential" (GEP) that is based on slope gradient and convergence developed by Burnett and Miller, 2007. All calculations are based on a 10 meter Digital Elevation Model. The GEP model does not take into account geology, soils, vegetative cover, hydrography or any other local information. It is only analysis of bare earth potential.

Results/Conclusion

This analysis indicated areas that were more susceptible to mass wasting in the context of potential delivery to channels. The results were not unexpected with areas at slope confluences and steep areas adjacent to channels showing the highest potential (Figure 6). This model predicts the source of most of the sediment and wood that could be delivered to channels. Sediment and wood delivery to channels are very important hydrologic functions but in this analysis we want to minimize sediment delivery to channels. This analysis helped inform treatment locations and potential temporary road locations. The information derived from the GEP analysis was augmented with field observations and site specific vegetation and soils data. The Oregon Department of Geology and Mineral Industries indicate no historic records of major landslides in the analysis area as of August, 2014. Local records and field observations indicate smaller mass wasting events that are most likely associated with high flow events such as the flood event of 1996-97.

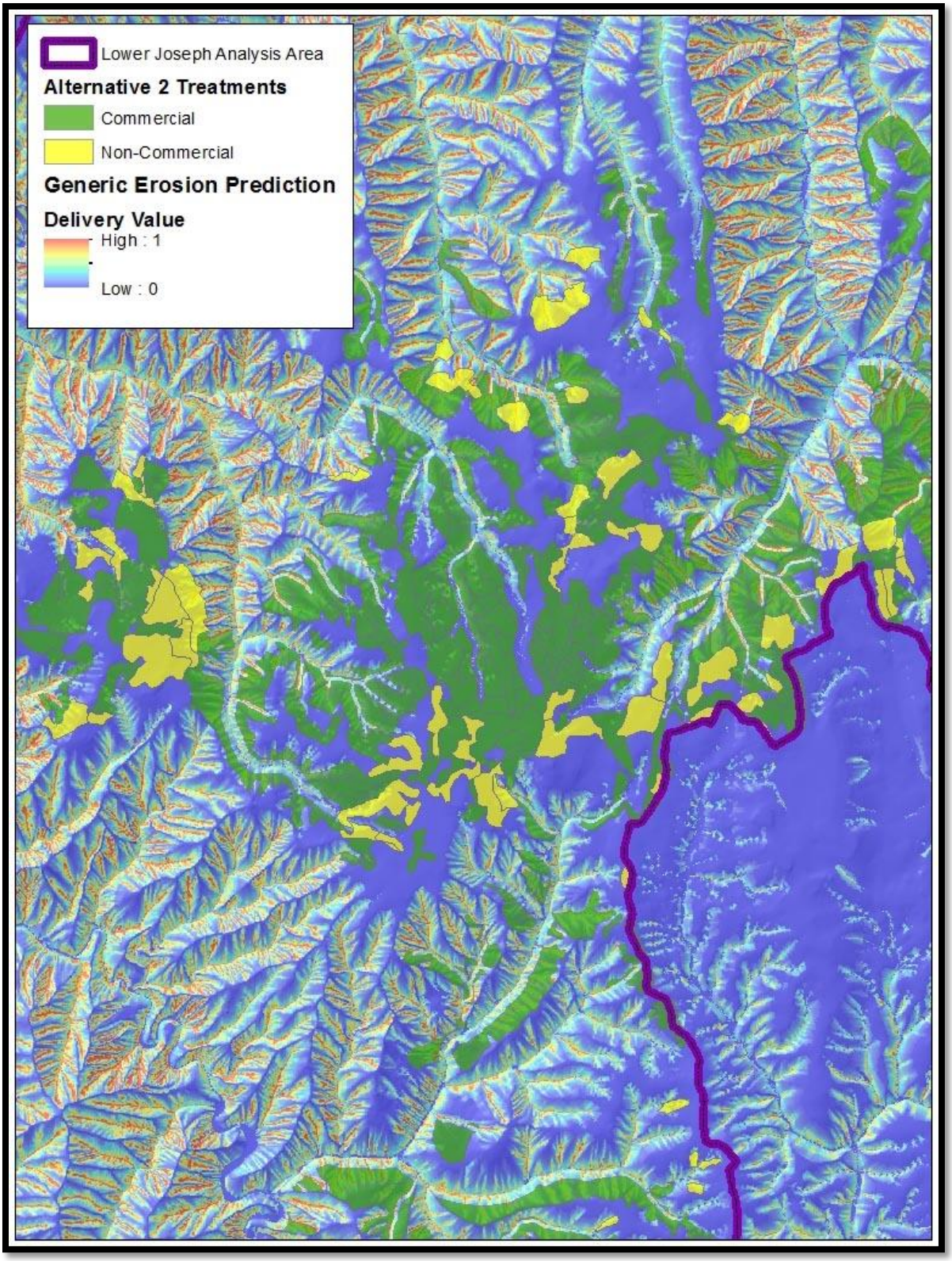

Figure 6: Example of GEP delivery which displays the likelihood of sediment and wood delivery by shallow landslides and debris flows.

Detrimental Soils Condition Analysis and Survey

Method Used:
Detrimental Soils Condition (DSC) surveys conducted from June to September, 2015 in accordance with the 2009 U.S. Department of Agriculture, Forest Service Soil-Disturbance Field Guide (0819 1815—SDTDC).

System and non-system roads will be included in the DSC surveys as described in R-6 Supplement No. 2500.98-1

Assumptions:
We only have reliable forest activity from 1970 for the LJCRP analysis area. This data does not indicate the method of harvest or type of equipment used, making it more difficult to estimate potential soils impacts. In 2010, physical records were lost in the fire that consumed the Forest Service district office in Enterprise that would have provided timber sale specific information regarding the specific harvest methods. Therefore, we took a conservative approach with our survey strategy and assumed that all know previous harvest activities that intersect LJCRP activity units would be surveyed.

Results/Conclusion
If surveys indicate that an activity unit/stand exceeds 20% Detrimental Soils Conditions then one or more of the following actions would occur:

- No further ground disturbing activity would occur in that unit/stand
- Legacy soils effects to that unit/stand would be remediated to the extent that any additive DSC contributions from the LJCRP activities would not exceed 20% DSC.
- Modify harvest method so as not to exceed 20% DSC for that unit/stand or consider winter operations (minimum of 4" of frozen ground or 2' of snow).
- DSCs from roads were estimated under low and high impact scenarios using standard metrics during survey. Specific existing system and non-system road impacts should be validated during layout and design then mitigated as described in this document, the Project Design Criteria and the Best Management Practices.

Unit specific surveys are attached to this report and are available in the project file.

- Surveys were conducted by: Michelle Chapin in June through September of 2016
- DSC Data was summarized on 10/26/2016

Remediation and Mitigation of Legacy and Proposed Activity Soil Disturbances

The local soils specialist or hydrologist should work with the sale administrators to review the DSC survey notes and evaluate any effects to soils resources from the LJCRP activities and design appropriate mitigations and/or remediation. Additionally, local specialists should consider the evaluation guidelines described in Restoring and Enhancing Productivity of Degraded Tephra-Derived Soils by Chuck Bulmer, Jim Archuleta and Mike Curran (2011).

General Recommendations

Soils with an Ash Component

- Soils with an ash component are very common in the LJCRP area. Ash soils are particularly susceptible to compaction and erosion. Therefore, care must be taken to maintain adequate ground cover, particularly on slopes.
- In deeper soils (>30cm) subsoiling is an appropriate mitigation in areas of compaction
- In areas of general disturbance, the top layer (A Horizon) should be pulled back over any disturbed surface. (Pull berms back over disturbed surfaces)
- Erosion control is very important for ash soils. A weed free straw or equivalent should be applied prior to seasonal precipitation on slopes exceeding 15%, adjacent to waterways and ditches.

Vertic or Clay-Rich Soils

- Vertic soils typically have a high clay mineral content and are particularly susceptible to smearing and rutting.
- Vertic soils can be operated on with caution when the soil column is either frozen or completely dry, otherwise avoidance should be practiced.
- Subsoiling deeper vertic soils can be beneficial if there is enough organic material to incorporate. If organic material is limited, there are no practical mitigations for impacts to vertic soils.

Shallow soils

- Avoidance should be practiced on shallow soils. If shallow soils (<10inches) must be operated on, caution should be used to minimize disturbance and compaction.
- Shallow soils can be operated on over 4” of frozen ground or 2’ of snow.
- There are few practical mitigations for impacts to shallow soils. Therefore, care must be taken when working on or around them.

References Cited - These references are specific to this document. Please see the Reference Cited in the LJCRP FEIS for additional resources.

Chuck Bulmer, Jim Archuleta and Mike Curran, 2011 Restoring and Enhancing Productivity of Degraded Tephra-Derived Soils in: Page-Dumroese, Deborah; Miller, Richard; Mital, Jim; McDaniel, Paul; Miller, Dan, tech. eds. 2007. Volcanic-Ash-Derived Forest Soils of the Inland Northwest: Properties and Implications for Management and Restoration. 9-10 November 2005; Coeur d'Alene, ID. Proceedings RMRS-P-44; Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

USDA Forest Service, 2009. U.S. Department of Agriculture, Forest Service Soil-Disturbance Field Guide (0819 1815—SDTDC).

USDA Forest Service, Forest Service Manual, Title 2520 – Watershed Protection and Management, R-6 Supplement No. 2500.98-1, Portland, Oregon

Lower Joseph Watershed Vegetation Management Project - Soil Pre-Activity Soil Disturbance Survey Data, Estimated Post-Activity, Comments

Unit	Total Class 2 and 3 DSCs without FS Roads (%)	Total Existing Class 2 and 3 DSCs with 5% FS Roads (%)	Expected Total DSCs without FS Roads (%) (assumed 10% new)	Expected Total DSCs Including FS Roads (%) (Assumed 10% new)	Comments : Location, Soil Type, plant community, historic logging and soil impacts, suggested mitigations or restoration
11	3.7	8.7	13.7	18.7	Off Rd 609. Variable soil types; Very dry, shallow, rocky residual soil with pockets moderately deep ashy loam. Pipo/Caru associated with shallower soils on south end unit. ABGR associated with mod deep ashy soils. High ground cover on South end unit. Low ground cover on N end unit. 1-2 historic harvests. Highest DSC adjacent to road 609 and 46. N Section unit with Blue marked trees. Mitigation/Restoration opportunities: Minimal decompaction opportunities – soil depth and rock content variable = generally too shallow.
20	6.0	11.0	16.0	21.0	Off Rd 596. Moderately deep ash over residual loam. Soils deeper with deeper ash cap on south end. Soils become shallower and rocky on north end unit. Plant community Psme/Loac/Pipo/Caru. With Pipo predominately on North end. Good ground cover throughout. Two historic harvests with displacement as primary soil disturbance from wheel ruts/harvest large Pipo. Newer skid trails associated with more recent harvest - with compaction as primary disturbance – associated with Rd 596. Moderate decompaction oppertunities - variable soil depths, and historic displacement is recovering – also not restored with decompaction activities.
24A	3.7	8.7	13.7	18.7	Unit 24 – very large unit – it was broken into 3 sections (A,B, C) to more effectively survey. Off Rd 595- Moderately deep to deep ash, high soil cover. Psme/Abgr/Pipo - - decadent stand with high amount of DWM, wind throw and root rot. Skid trails tend to run N/E S/W – approx. 50 to 100ft spacing - with highest concentration adjacent to Rd 595. Haul Rd/main ST just north of Rd 595-596. Moderate decompaction opportunities if DSCs exceed limits after new activities – use caution due to variable soil depths and rock, undulating topography, and high amount of DWM. New DSC can be mitigated with use of existing ST and haul routes.
24B	5.1	10.1	15.1	20.1	Off Rd 596 – Mosaic of deep ash capped soils and shallower ash/ residual mixed with cobbles. Mixed conifer – predominately Pipo – late seral Psme/Libo2/Vame/Caru. Two historic harvests – Skid trails are numerous both random throughout and perp to Rd 596. Many historic class 2 skid trails have recovered to class 1 status – particularly soil displacement. Soil disturbance concentrated on areas adjacent to Rd –newer usable skid trail pattern – approx. 50 to 100 feet spaced. Moderate to good soil Mechanical decompaction possible of main skid trails if warranted post activity.
24C	4.6	9.6	14.6	19.6	Off Rd 608 - Moderately deep to deep ash, high soil cover. T1 and T2 soils variable and rocky, T3 soils deeper with lower rock content. Psme/Abgr/Pipo/Vame/Libo2 - - decadent stand with high amount of DWM, wind throw and root rot. Moist soils with high veg and duff cover – including annual moss. Most DSC associated with new PIPO logging. Historic skid trails obvious – with ruts

Unit	Total Class 2 and 3 DSCs without FS Roads (%)	Total Existing Class 2 and 3 DSCs with 5% FS Roads (%)	Expected Total DSCs without FS Roads (%) (assumed 10% new)	Expected Total DSCs Including FS Roads (%) (Assumed 10% new)	Comments : Location, Soil Type, plant community, historic logging and soil impacts, suggested mitigations or restoration
					and wheel displacement as primary disturbance – recovering. Highest concentration of skid trails adjacent and associated with Rd 596. Interior of unit with low DSCs. Moderate Mechanical decompaction possible – if post activity warrants – particularly for deeper soils associated with T3.
25	4.8	9.8	14.8	19.8	North of Dougherty CG and off Rd 570 - Moderately deep to deep ash, high soil cover. T1 soils variable and rocky, T2 and T3 soils deeper with variable rock content. Psme/Pipo - decadent stand, highly stocked with high amount DWM. Two historic harvests – Historic skid trails obvious – random pattern – with ruts and wheel displacement as primary disturbance – recovering. Highest concentration of skid trails adjacent to open meadows and rods. Interior of unit with low DSCs. Moderate decompact opportunity– if post activity warrants – particularly for deeper soils associated with T3. Moderate Mechanical decompaction possible - T2 + T3.
30	6.5	11.5	16.5	21.5	Moderately deep residual/ash mixed soil. Dry site with Pipo/Psme/ Caru – Abgr/Vame/Syal/straw associated with soils with higher ash content. Duff and veg cover greater than 65 – 85%. Two historic harvests. With recovering random skid trail pattern with both detrimental soil displacement and compaction - minimal Mechanical decompaction possible due to variable soil depth and rock content.
31	7.8	12.8	17.8	22.8	Off Rd 572 – Mosaic of shallow, moderately deep and deep ash soils Popo/Caru associated with shallower residual rocky soils. Psme associated with deeper ash capped. Two historic harvests skid trails numerous and obvious- generally run SE/SW- Mitigation may include potentially useable skid trail pattern - minimal decompact opportunities- variable soil depth and rock content. Old DSC is recovering and thus not severe or concentrated enough to warrant Mechanical decompaction.
32 A,B	4.6	9.6	14.6	19.6	Off Rd 570 and 475 – Moderately deep ashy loam with variable rock content. Site is a mosaic of dry (savanna) Pipo surrounded by dry scabby meadows and areas of deeper soils and mixed conifer (Psme/Abgr/libo2). Duff is greater than 65-85%. Veg 50 – 65%. Wind throw and DWM high. Appears one to two historic harvests, random skid trails – most past effects recovering. Minimal decompaction opportunities - variable soil depth and rock content.
54	5.0	10.0	15.0	20.0	Off Rd 4655 and 090 Mosaic of shallow to moderately deep mixed ash/residual soil with some boulders in natural openings. Plant group consist of open Pipo/Caru with mixed conifer. Two historic harvests – select harvest of large trees - Random skid trail pattern – recovering. Primary soil disturbance both ruts and displacement recovering. Slope 5-20% - no erosion noted.
57	4.0	9.0	14.0	19.0	Off Rd 46 - same as start of T1 Unit 48. Soils are a mosaic of gravely and cobbly moderately deep mixed ash/residual basalt with pockets of deeper ash capped soils. Low soil duff cover and plant cover associated with shallow soils. High DWM and duff cover associated with deeper ash soils. Moist meadow at start of T1 and large constructed pond to east of T1. Two historic harvests with select

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					harvest of very large Pipo and Psme. DSCs both detrimental soil compaction and displacement. Oldest skid trails recovering – newer skid trails with obvious soil damage. Appears some old Skid trails "ripped" with low effectiveness. Soil moisture intermittent throughout unit - as associated with wet meadows. Mitigation: Low to mod Mechanical decompaction possible due to variable soil depth, rock and soil moisture. Avoid skidding through moist meadows – soils will displace and compact easily.
58	7.2	12.2	17.2	22.2	Off Rd 46 – Moderately deep to deep ash. High duff and veg cover. Mixed conifer. ***Unit adjacent to Peavine Unit 27 – and proposed temp rd. also a historic skid trail/haul road is perpendicular to the proposed temp road – running W/E through unit.*** Skid trails obvious. Spring adjacent to unit – Mitigation: Use existing usable skid trail pattern and haul route to extent possible. High Mechanical decompaction possibilities – exiting compacted skid trails and haul route upon exit.
69	4.1	9.1	14.1	19.1	Off Rds 045 + 095. Open, dry Pipo stand with mosaic of shallow to moderately deep gravely, ashy loam and ash capped soils. Surface rock and rock content vary (15-25%) throughout unit. Low soil cover and veg cover. Pockets of deep ash throughout – associated with moister vegetation. Historic harvest; few, faint, random skid trails with recovering displacement as primary soil disturbance. - Low soil cover appears to be from recent Rxn burn. Two Rds within unit. Spring located above Rd 045 in open meadow. Mitigation: Minimal Mechanical decompaction possible due to variable soil depth and rock. Recommend no Rxn burning due to current low soil cover. Minimize skidding – ash capped soils over residual basalt appear to be susceptible to soil displacement.
70	2.7	7.7	12.7	17.7	Moderately deep gravely ash capped residual basalt. Highly stocked/water stressed Pipo/Psme. Site susceptible to displacement due to gravel/ash colluvium soils on steeper slopes (5- 20%) - Decompaction activities not recommended due to gravelly soils and slope. Minimal - closed road and landing above unit.
73	6.0	11.0	16.0	21.0	Mosaic of moderately deep ash to deep ash capped soils with pockets of shallow rocky residual basalt soil. Pipo/mixed conifer. Moderate duff and veg cover. Two historic entries. Skid trails obvious -Skid trails random. Newer, more obvious disturbance that other units in vicinity- affected by recent Baldwin TS units 52 and 73. Moderate mechanical decompaction possible.
75	6.6	11.6	16.6	21.6	Off Rd 095. Moderately deep to deep dry, gravely ashy loam. Variable soil depth throughout. Pipo/mixed conifer. Low duff cover, Greater than 65% veg cover. Two historic entries. Rxn burn cause of low duff cover. Random skid trails. Open meadow adjacent to Rd 095. Spring within unit. Decompaction restoration or Rxn burning not recommended due to variable soil depth and rock and low duff cover.
76	7.0	12.0	17.0	22.0	Moderately deep to deep ash capped soil. No surface rock or rock by content. Veg predominately

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					Psme/Vame with mixed conifer. Veg cover 60-80%. Duff cover 60 % ranging from 2 to greater than 4 inches thick. Two historic harvests. Large numerous historic skid trails with displacement as primary DSC and compaction as secondary. Skid trails appear old – recovering with veg and duff and natural decompaction. Mitigation: Use existing Skid trails when possible. If post activity impacts warrant – good mechanical decompaction opportunity.
78	3.7	8.7	13.7	18.7	Moderately deep to deep ash capped soils with pockets of shallow to moderately deep rocky residual basalt/ash mixed. Plant group is a mosaic of open dry Popo associated with shallow rocky soils and very dens Psme/Abgr. Good duff and veg cover (duff approx. 100% and veg greater than 65%). Two historic (selective) harvests. Skid trails obvious but random. Skid trails recovering, veg, duff and natural soil decompaction. Closed roads cut through unit – no erosion observed. Mitigation: Use roads in unit and existing skid trails to extent possible to reduce new soil impact good mechanical decompaction opportunity – but only on severely compacted trails and landings.
81	6.1	11.1	16.1	21.1	Off Rd 4655. Moderately deep to deep ash capped soils with pockets of shallow to moderately deep rocky residual basalt/ash mixed. Plant group is a mosaic of open dry Popo associated with shallow rocky soils and very dens Psme/Abgr. Good duff and veg cover (duff approx. 100% and veg greater than 65%). Two to three historic (selective) harvests. Skid trails obvious but random. Skid trails recovering, veg, duff and natural soil decompaction. Spring within unit. Closed roads cut through unit – appear to have accessed Unit 79 (skyline unit). Mitigation: Use roads in unit and existing skid trails to extent possible to reduce new soil impact good mechanical decompaction opportunity – but only on severely compacted trails and landings.
83	6.0	11.0	16.0	21.0	South of Coyote CG - off Rd 46. Mosaic of moderately deep to deep ash with ash/residual basalt soils over fractured basalt. Duff approx. 25 – 65% cover. Vegetation cover greater than 65% cover. Plant group Pipo/Caru associated with ash/residual soils. Moister Abgr/Psme associated with deeper ash capped soils. High gopher activity. Two historic harvests. Numerous obvious skid trails – run generally E/W. Main haul skid trail/haul rout in unit. Older skid trails recovering – newer skid trails exhibit soil compaction. – Mitigation: use existing skid trails to reduce new DSC impacts. Mod mechanical decompaction opportunity on west side of Rd 46 – use caution – may bring up fractured basalt under ash capped soil. Good mechanical decompaction opportunity on east side Rd 46. Soil restoration opportunity outside of unit boundary east of Rd 46, just south of northern lobe (see project map).
85A	4.8	9.8	14.8	19.8	Off Rd 4650 – 4655. Generally soils are moderately deep to deep ash capped soils with little to no soil rock. Duff cover 100% and vegetation cover greater than 65%, and very high amount of DWM. Wind

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					throw and root rot throughout unit. Plant group is older, decadent stand of Abgr/Psme/Libo2 with some Pien. Evidence 2 or more historic select harvests. Skid trails are slightly obvious, random and generally recovering. Many old class 2 DSCs have recovered to class 1 soil disturbance. Historic skid trails are very well vegetated with good duff cover. No evidence of soil erosion or weed infestation. Unit is circled by roads. Good mechanical decompaction opportunity for NEW soil compaction. Old soil Comp recovering to point naturally that mechanical decompaction is not recommended. Additionally, root rot and very high amount of DWM may pose challenges with mechanical decompaction activities.
85B	4.7	9.7	14.7	19.7	Off Rd 4655 + 025. Unit similar to 85A. Generally soils are moderately deep to deep ash capped soils with little to no soil rock. Some pockets of shallow to moderately deep residual ash, rocky soils in unit. Duff cover 100% and vegetation cover greater than 65%, and very high amount of DWM especially on North end of unit. Site subject to wind throw and root rot throughout unit. Plant group is older, decadent stand of Abgr/Psme/Libo2 with some Pien. Evidence 2 or more historic select harvests. Skid trails are slightly obvious, random and generally recovering. Historic skid trails are very well vegetated with good duff cover. Many old class 2 DSCs have recovered to class 1 soil disturbance. No evidence of soil erosion or weed infestation. Good mechanical decompaction opportunity for NEW soil compaction. Old soil Comp recovering to point naturally that mechanical decompaction is not recommended. Additionally, root rot and very high amount of DWM may pose challenges with mechanical decompaction activities.
85	4.5	9.5	14.5	19.5	Unit similar to 85A and B. Generally soils are moderately deep to deep ash capped soils with little to no soil rock. Some pockets of shallow to moderately deep residual ash, rocky soils in unit. Duff cover 100% and vegetation cover greater than 65%, and very high amount of DWM. Site subject to wind throw and root rot throughout unit. Plant group is older, decadent stand of Abgr/Psme/Libo2. *Pacific Yew throughout unit* – specifically within the SE section. Evidence 2 or more historic select harvests. Old skid trails are faint and recovering with vegetation and good duff cover. Newer skid trails are obvious with soil compaction and minimal soil cover. Unit adjacent to Poker unit 22 (HCR). Mitigation: Potentially usable ST pattern – tend to run NE/SW at approximatley 5- to 100 ft spacing - use existing skid trails to extent possible to reduce new DSCs. Good mechanical decompaction opportunity for NEW soil compaction and pre-existing highly compacted skid trails. High amount of DWM may pose challenges with mechanical decompaction activities.
86	6.7	11.7	16.7	21.7	Off Rd 390. Dry shallow to moderately deep gravely, cobbly ashy loam soils. Less soil cover than expected for the site. Mosaic of ground cover with duff ranging from 25 – 65% and veg cover

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					generally greater than 65. Vegetation type is dry Pipo/Caru/Syal. Evidence of two historic harvests. Table Mountain and Lone Dog most recent. Recent Rxn burning appears to be cause of low soil cover. Closed roads not on system maps within unit. DSCs consist of both soil compaction, soil displacement/deep ruts and small landings within unit. Animal trailing common. Mitigation: Potentially usable skid trail pattern. Use existing Skid trails and old haul routes to extent possible to reduce new DSCs. Use of Low PSI equipment under dry soil conditions will help mitigate new DSCs. Low mechanical decompaction opportunity due to variable soil depth and soil rock cover and soil rock content.
87	4.9	9.9	14.9	19.9	Start at Lone Dog unit boundary/ T3@ Rd 370. Dry shallow to moderately deep gravely, cobbly ashy loam soils. Less soil cover than expected for the site. Soils on south ½ of unit are moderately deep soils with greater ash content and less rock. Mosaic of ground cover with duff ranging from 25 – 65% and veg cover generally greater than 65% - generally consisting of thick Caru mat. Vegetation type is dry Pipo/Caru on north ½ of unit with greater amount of Pipo/Psme on south half unit. Evidence of two historic harvests. Lone Dog, sumac, and B-vine most recent. Recent Rxn burning appears to be cause of low soil cover. DSCs consist of both soil compaction, soil displacement/deep ruts and small landings within unit. Closed non-system roads within unit. Animal trailing common throughout unit. Mitigation: Potentially usable skid trail pattern – generally run NS/ EW. Use existing Skid trails and closed to extent possible to reduce new DSCs. Thick Caru root mat may help reduce new soil impacts – specifically if Low PSI equipment used under dry soil conditions. Low mechanical decompaction opportunity due to variable soil depth and soil rock cover and soil rock content and thick Caru root mat that will "block out" and displace.
89	5.4	10.4	15.4	20.4	Start off Rd 46 - Dry shallow to moderately deep gravely, cobbly ashy loam soils. Less soil cover than expected for the site. Vegetation type is dry Pipo/Feid and Pipo/Caru with much of the Idaho fescue replaced with annual grasses. Mosaic of ground cover with duff approximately 25% and veg cover generally greater than 65%. Evidence of two historic harvests. Lone Dog most recent. Recent Rxn burning appears to be cause of low soil cover. DSCs primarily soil compaction small landings/slash piles within unit. Mitigation: Use existing Skid trails to extent possible to reduce new DSCs, use Low PSI equipment under dry soil conditions. Low mechanical decompaction opportunity due to variable soil depth and soil rock cover.
95	10.4	15.4	20.4	25.4	Off Rd 370. Moderately deep ash to ashy loam soils with minimal rock cover and content. Plant type is dry pipo/psme/Ninebark and annual grasses. Duff is thin due to Rxn burn with approx. 20-50% cover. Veg cover greater than 65%. Two historic harvests – large Pipo trees removed – heavy cutting

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					– skid trails both random and with N/S pattern. DSCs consists of both detrimental soil compaction and soil rutting. Mitigation: Use existing skid trails to extent possible – use Low PSI equipment to reduce potential new impacts. Good to moderate mechanical decompaction opportunities on old severely compacted skid trails where soils are deep enough. Comment: it appears that due to low elevation, and over stocking –the result is moisture stress. Site is very dry even though moderately deep pure ash soils would suggest differently – due to dryness – natural restoration of past detrimental soil damage is slow.
96	20.6	25.6	30.6	35.6	Off Rd 300 – A very large unit dissected by several FS system roads and several closed non-system/historic haul skid trails/rds. Mosaic moderately deep ash to gravely ashy loam soils with minimal rock to shallow to moderately deep, rocky mixed ash/residual. Plant type is a dry, late seral Pipo/Psme/Feid/Caru. T3 area moister with Psme/Loac. South end unit Duff and veg greater than 65% cover. North half veg greater than 65% cover but duff is thin due to Rxn burn with approx. 20-50% cover. Two quite old, historic select and or HCC harvests – very large Pipo trees removed – heavy cutting – many major skid trails with high amount of DSCs, random and with N/S and E/W pattern. T3 area has been more recently select harvested. DSCs consists of both detrimental soil compaction and soil rutting. Animal trailing disturbance common throughout unit. Comment: it appears that due to low elevation, and over stocking –the result is moisture stress. Site is very dry even though moderately deep pure ash soils would suggest differently – due to dryness – natural restoration of past detrimental soil damage is slow. Mitigation: Good mechanical decompaction opportunity for skid trails, landings and historic roads with sever soil compaction – particularly T1 corresponding with south end of unit and areas adjacent to Rds 46 and 300. Due to variable soil depth and rock associated with T2 and T3 mechanical decompaction of skid trails with caution. Use of old roads, skid trails and/or use of Low PSI or winter logging will reduce risk of new detrimental soil impacts on this already highly impacted unit.
97	6.1	11.1	16.1	21.1	Off Rd 300. Dry shallow to moderately deep gravely, ashy loam. Veg and duff approx. 50 to greater than 65% cover. Plant community is Pipo/Feid with annual grasses. Two or more historic harvests. Most recent was Lone Dog 56. Older skid trails are faint and recovering. Newer skid trails with surface soil compaction – but good veg cover – and beginning to naturally decompact. Low mechanical decompaction opportunity due to variable soils with shallower, rocky soils.
100	3.2	8.2	13.2	18.2	A very small isolated unit with moderately deep to deep pure ash capped soils. Decadent Agbr/Psme /Vame/Libo2 vegetation group. Decadent, over stocked stand subject to root rot and wind throw. High amount of DWM. Duff cover approximately 100%, veg cover greater than 65%. Ash capped soils are

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					very susceptible to compaction and displacement. Slope approx. 5-15%. Evidence of two historic harvests. Primary soil disturbance is soil displacement and rutting – recovering with duff and vegetation. High mechanical decompaction opportunities if post activity impacts warrant – however use caution due to high DWM, veg cover that will block out and root rot.
101	7.0	12.0	17.0	22.0	Off Rds 4655 + 045. Soils are mosaic of moderately deep to deep ash/ash capped soils and moderately deep to deep gravely/cobbly ashy loam. High duff, veg cover and DWM. Plant group variable depending on location in unit. Veg group ranges from moist Abgr/Psme to more open Pipo/Caru/Rosa/Syal. There is a wet meadow in center unit with Pien. Evidence of two historic harvests with numerous skid trails, both random old skid trails and newer skid trail patterns. Soil compaction newest and most evident DSCs. Newest harvest corresponds with Lone Spruce unit 13A. Older soil displacement is recovering with veg and duff. Appears some skid trails have been "ripped" in past – causing displacement and low amount of restoration of soil compaction. Numerous roads both closed and open within and surrounding unit. High amount of grazing impacts. Low duff cover on some areas due to recent Rxn burning. Mitigation/Comments: new impacts can be reduced by using existing skid trails and Rds to extent possible, or Winter log or use low PSI equipment. Moderate mechanical decompaction opportunities due to variable soil depth and rock content throughout unit. Rds could be decommissioned to reduce existing DSCs.
102	6.2	11.2	16.2	21.2	Start off north tip of unit 102. Very small unit dissected by two rds. Variable soils with shallower rocky residual basalt/ash mixed soils and pockets of moderately deep to deep ash. Dry Pipo plant group. Two historic harvests with compaction as primary DSC. Skid trails are recovering naturally closed road recovering with vegetation. Landing in meadow above Rd 045. Comments/mitigation: used existing skid trails and roads to extent possible to reduce new soil disturbance. Low mechanical decompacting opportunities due to shallower rocky soils.
103	5.1	10.1	15.1	20.1	Off Rd 032. Soils moderately deep to deep ashy with mixed conifer. Duff and veg cover greater than 65%. DWM high. Two Rds within unit, spring adjacent rod 048. Evidence of two historic harvests. Skid trials are both faint and recovering and more obvious random skid trails with soil displacement as primary DSC recovering with veg and duff cover. Comments/Mitigation: use interior roads, obvious skid trials and adjacent landing to extent possible to reduce potential new DSCs. Potential to mechanically decompact NEW skid trails if degree and extent of new soil compaction warrants. No treatment of historic soil displacement or soil compaction suggested due to high extent of natural recovery.
107	5.8	10.8	15.8	20.8	Only surveyed large polygon west of Rd 032. Soils a mosaic of moderately deep to deep rocky, ashy

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					loam soils. Popo/mixed conifer plant group – with Pipo highly associated with rockier soils. Evidence of two historic select harvests. Portions of the unit with blue marked trees that were not cut (Baldwin Unit?). Primary detrimental soil disturbance is compaction with some displacement. Small landings and slash piles throughout Pipo stands/open meadows. Moderate mechanical decompaction opportunities due to variable soil depth and rock content.
109	4.0	9.0	14.0	19.0	Dry moderately deep/ deep gravely residual/ash and ash colluvium soils. Large diameter /old Pipo/Psme with dry understory of Caru/Snowberry. High duff and veg cover. Appears only one historic harvest. Soil disturbance is primarily displacement – recovering. Majority of skid trails on south end of unit associated with lower gradient. Skid trials few, obvious running E/W direction. Closed road dissects south end unit. Mitigation/comments: due to slope steepness and gravely/colluvium soils – they will displace easily. Use exist skid trails and closed road to extent possible, caution high displacement potential. Low mechanical decompaction potential due to rocky soils that will ravel easily. High amount of snowberry and Caru will complicate subsoiling efficiency.
110	3.0	8.0	13.0	18.0	Unit above E-draw with signs erosion. Rocky, mixed residual/ash soils with variable rock content. Dry open Popo/Caru. One to two lighter historic harvests. Potentially cable or sky line logged on lower sections below road. Visible skid trails recovering. Comments/mitigation: Low mechanical decompaction opportunities due to slope and rocky soils. Also, this unit lies above a very dense stand of Psme/Abgr associated with deep ash soils within an e-draw that show signs of accelerated erosion. This dense stand of trees has many blue marked trees that have not been cut. This area has a high potential fire risk – and high risk of post fire accelerate erosion. Runoff from shallow dry soils above associated with unit 110 will cause lower slopes to erode if they experience a high intensity burn.
111	7.0	12.0	17.0	22.0	Moderately deep to deep ash/ashy loam. Pipo/Psme /Abgr veg group. High amount of duff cover (90%), and lower veg cover (25%). Potentially only one historic harvest. Skid trails are obvious with both detrimental soil compaction and displacement. Three Rds and Kirkwood spring withing unit. High amount of animal trailing on roads and historic skid trails causing much of the current soil disturbance/compaction associated with historic skid trails. Comments/Mitigation: use roads and existing skid trails to reduce potential new DSCs. Moderate to good mechanical decompaction. Suggest mitigation/reduction of animal trailing/use of skid trails post timber harvest and post soil restoration.
112	8.0	13.0	18.0	23.0	Off Rd 065. Moderately deep to deep ash capped soils. Pipo/mixed conifer. Seep adjacent to road 065. High amount of DWM and high ground cover. Site susceptible to root rot and wind throw. Two historic harvests. Obvious slide trails with soil compaction as primary DSC. Mitigation/ comments:

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					Use existing skid trails pattern (perp to road) to reduce potential new DSCs. Moderate to high potential to use mechanical decompaction to restore compacted soils. Avoid shallower rocky soils associated with large Pipo and moist springs adjacent to and within unit. Suggest mitigate post activity animal trailing, dispersed recreation/ATV/Hunter use of skid trails and mechanically restored areas.
114	2.8	7.8	12.8	17.8	Below end of Rd 390. Unit has colluvium soils of variable depth and rock content. Slope gradient ranges from 5 to greater than 25%. Veg group is variable, open, dry Pipo/Psme/Caru/Syal. Good veg cover. East boundary of unit with deeper ash/Psme/Abgr. One to two historic harvests. Skid trails few and faint. Both detrimental soil compaction and displacement. May have had some cable logging. Mitigation: Low mechanical decompaction opportunities due to variable soil depth, rock and slope gradient. "Closed" road in unit not obvious.
118	4.5	9.5	14.5	19.5	Off Rd 340. Dry shallow to moderately deep, rocky ashy loam with variable surface rock and cobbles. Dry Pipo/Caru/Fied. Two historic harvests. Skid trails faint and recovering. Both displacement and soil compaction. Low duff cover, veg cover 45 to 65%. Rock cover variable. No signs of accelerated erosion. Too rocky and shallow to mechanically decompact soil compaction. Surface rock will help mitigate new DSCs under dry conditions and particularly with use of Low PSI logging equipment.
123	11.1	16.1	21.1	26.1	Off Rd 268. Mosaic of cobbly ashy loam and cobbly, gravely silty clay loam over residual basalt (T1) and moderately deep ash (T2). Moderate duff cover, vegetation generally greater than 65%. Annual moss cover intermittently on steep, north facing slopes with high canopy cover, and perennial seeps. Late seral Pipo/Syal/Fied– Psme/Loac. Undulating topography – much of unit with slope gradient ranging from 5 – 15 – 30 – 50%. Two historic harvests with high DSCs associated with soil displacement and soil compaction on skid trails, landings and closed roads. Skid trails both random and perpendicular and parallel to open and closed roads. Skid trails up draws. High amount of animal trailing on skid trails and along fence lines that lead to pond within unit. Accelerated erosion, rilling noted on steep slopes and along fence lines perpendicular to draws that flow directly into Sumac Creek (see photos). Closed Roads within unit not on GIS layer – steep road cuts, but road beds revegetating naturally with trees and understory. Soils are highly susceptible to both compaction and displacement. Several skid trails "ripped" in past causing soil displacement without decreasing soil compaction. Low to moderate mechanical decompacting opportunities due to variable soil depth, rock content and slope. Low gradient sites with deeper pure ash soils can be subsoiled. Recommend cable/skyline on slopes greater than 25%, WL or Low PSI for proposed activities.
132A	4.0	9.0	14.0	19.0	Off Rd 4650/Closed road 030. Very large unit predominately with deep ash capped soils, less than 5%

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					rock by content. Moderately deep ash soils with some rock associated with T2. Heavily stocked decadent Psme/Abgr/Loac/Pien/Libo2. High amount of DWM. Duff (up to 2" thick) and veg cover greater than 65-80%. Site susceptible to root rot and wind throw. Two historic harvest activities, very old and recovering with veg and duff. DSC and soil disturbance both associated with soil displacement and compaction. Skid trails are faint, spaced approx. 50 to 100 ft apart, and primarily perpendicular to Rd 030. Old rod/ATV trail cuts from Rd o30 through unit to open Pipo in Unit 107 – no erosion noted. Rds 030/032 labeled as closed – but obviously used by vehicular traffic and ATV use. Looks like shelter wood harvest unit marked in recent past – but not cut. Some seeps in unit. Comments/Mitigation: Deep ash soils highly susceptible to soil compaction and displacement. Good mechanical decompaction potential if warranted post activity. Use of existing skid trails and closed roads will help mitigate new DSCs.
132B	4.8	9.8	14.8	19.8	Off road 4655/ Rd 045. Similar soil and vegetation group as unit 132A. High amount of DWM. Duff (up to 2" thick) and veg cover greater than 65-80%. Site susceptible to root rot and wind throw. Two historic harvests have resulted in moderate high amount of DSCs that are now recovering class 1 soil disturbance. Moist ash soils are susceptible to soil compaction and displacement. Several roads dissect unit. Good mechanical decompaction potential if warranted post activity. Use of existing skid trails and closed roads will help mitigate new DSCs.
132C	4.4	9.4	14.4	19.4	Off Rd 4650/Rd 060. Small unit north of Unit 292. This unit 132 C has different soil and veg than other unit 132 polygons. Site is dry with moderately deep ash soils and large diameter Pipo/Loac. Good veg and duff cover. One historic harvest of very large diameter trees. Skid trails old, large and obvious – but ruts and compaction recovering naturally. Comments: soils will displace and compact easily with ground based equipment. Mechanical decompaction opportunity possible if post activity impacts warrant.
138	2.6	7.6	12.6	17.6	This is a large unit with the majority of the unit proposed for skyline/helicopter logging. Only the southeast section is proposed for tractor logging. Located off Rd 4650/ Rd 060 and north of Unit 140. Soils are deep ash with little to no rock by content. Good duff and veg cover. Vegetation is mixed conifer/Popo/Psme – highly stocked and very overgrown. One to two historic harvests, with few, faint skid trails with minimal DSCs. Most soil disturbance is recovering. High mechanic decompacting opportunities – only if post- harvest warrants.
140A, B,C	5.3	10.3	15.3	20.3	Large unit broken up into three polygons. Unit 140 A, B and C are labeled from south to north up Rd 060. Generally soils are moderately deep cobbly, ashy loam over residual basalt. Open, dry Popo with good duff and veg cover. Two historic harvests. Skid trails both obvious and faint, primarily

Unit	Total Class 2 and 3 DSCs without FS Roads (%)	Total Existing Class 2 and 3 DSCs with 5% FS Roads (%)	Expected Total DSCs without FS Roads (%) (assumed 10% new)	Expected Total DSCs Including FS Roads (%) (Assumed 10% new)	Comments : Location, Soil Type, plant community, historic logging and soil impacts, suggested mitigations or restoration
					compacted with some soil displacement. Soil disturbance recovering naturally. Low to moderate Decompact oppertunities - variable soil depth and rock. Suggest use of low PSI or WL to reduce potential of new DSCs.
141	6.0	11.0	16.0	21.0	Off Rd 060, located just north of unit 140C. Moderately deep to deep ash capped soils over clayey residual basalt soils. Psme/Libo2. High amount of DWM, veg and duff cover. Site subject to root rot and wind throw. Two historic harvests. Skid trails both faint recovering and obvious with detrimental soil compaction and displacement leading into a non-system haul route. Comments/Mitigation: Road 060 is not hardened road (native ash roadbed). Road has much accelerated water erosion/large rills and small gullies. Proposed temp road appears to correspond with Lone Pine Unit 6. To minimize new DSC with use exist haul route and newer skid trails – especially those associated with Lone Pine Unit 6. High mechanical decompacting opportunities if warranted post activity.
142+143	3.8	8.8	13.8	18.8	Off Rd 4650/ Rd 070. These two units were combined due to similar soil and vegetation types, and historic impacts. Soils are shallow to moderately deep gravely and cobbly ashy silt to clay loams over clay loam. Low surface veg and duff cover. Open, very dry Pipo adjacent to and mosaic with open, scabby dry rocky meadows. Skid trails are random and faint with minimal detrimental soil compaction and displacement. Mitigation: Use low PSI or Winter log. Although, rock may mitigate new DSCs limit skidding on shallow, dry soils with low veg and duff soil cover. No decompaction opportunity due to shallow, rocky soils.
144	5.8	10.8	15.8	20.8	Off Rds 081 + 082. Small unit with moderately deep gravely, ashy loam over silty clay loam residual basalt soils. Dry Pipo/Caru. Mound/inter-mound topography and veg group on east end of unit. Two historic harvests with a high amount of animal trailing/use. There are numerous developed springs/ponds in local vicinity. Areas of Caru/native grasses transitioned into annual grasses with lower soil veg and duff cover than expected for the site. Veg approx. 65% cover, duff less than 25% may be due to high grazing and past Rxn burn. Many, old skid trails recovering. Current DSCs are primarily soil compaction associated with skid trails and small slash piles. Highest concentration of DSCs is adjacent to Rds 081 and 082. Not recommended to subsoil due to shallower rocky soils. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
145	5.8	10.8	15.8	20.8	Off Rd 46+081. Soils variable with moderately deep ash to deep ash over fractured basalt. Pipo/Caru and Psme/Abgr /Straw/snowberry. Duff and veg cover greater than 65-80%. Two historic harvests (Dogfight and Lupine). Skid trails obvious in both random and useable pattern. Several old haul routes/non-system roads in unit – appear used for commercial and non-commercial animal trailing to a

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					developed stock pond and a very large permitted hunting camp/structure. Mitigation/Comments: use of existing non-system haul routes and skid trails may reduce risk of new DSCs. High mechanical decompaction opportunities of old skid trails and roads if post-harvest conditions warrant. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
146	4.4	9.4	14.4	19.4	Variable soils depth, predominately shallow to moderately deep with variable rock content. Greater than 65-80% veg cover – predominately Caru. Veg type is dry Pipo/Caru and Psme with some Loac associated with deeper soils on north boundary. North boundary of unit has adjacent spring, steeper slopes and deeper ash soils associated with Loac. Two historic harvests with low amount compaction and displacement/ruts DSCs. Highest concentration of DSCs are on north boundary of unit. Mitigations/comments: Mechanical decompaction not recommended due to variable soil depth and rock content. Use of Rds within unit, Low PSI or WL will help reduce risk of new DSCs. Thick Caru root mat will mitigate new soil impacts.
147	2.5	7.5	12.5	17.5	Off Rds 082 + 080. Small unit with moderately deep to deep ash soils and pockets of residual basalt/ash mixed soils. High amount of DWM, 100% duff cover. Late seral Pipo/Psme – highly stocked and decadent. Site susceptible to wind throw. Appears only minimal historic harvests and associated DSCs. Soils are susceptible to soil displacement and compaction. Moderate mechanical decompaction opportunities – but not recommended due to variable soil depth and underlying rock.
150	8.3	13.3	18.3	23.3	Off Rds 300 + 350. Large unit on east facing upper ridge shoulder. Variable soils ranging from very dry, shallow, rocky residual basalt to moderately deep ashy loam. Slope ranges from 5 to 20%. Soils on west boundary of unit are predominately very dry, shallow and rocky. Open Pipo/Caru. Multiple historic and more recent harvests and Rxn burning. Historically very large diameter Pipo removed resulting in multiple obvious skid trails associated with primarily detrimental soil compaction and less severe displacement/rutting. Skid trails are both random and at approx. 60 foot spacing. Soil compaction is recovering at approx. 2 inch depth – but platy soil consistently observed below 2 inches. Old non-system haul route in unit. Highest concentration of soil damage on north end of unit and adjacent to Unit 303. South end unit appears to have had more recent harvest activity – but also less overall severity and extent of DSCs. Low to moderate mechanical decompaction opportunities. Greatest opportunity on north end of unit. Recommend winter logging, use of Low PSI and use of existing skid trails and roads to extent possible to reduce risk of new DSCs.
151	8.1	13.1	18.1	23.1	Off Rd 350. Unit adjacent to Unit 150 but has very different soil types, veg types and historic soil conditions. Soils are moderately deep colluvium, gravely ashy loam with variable cobble content.

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					Slope ranges from 5 to greater than 30%. Highly stocked, very dry Psme with scattered large diameter Pipo/Ninebark at 3800 feet elevation. Historic harvest resulted in several skid trails that parallel road above and below unit. Soil disturbance is primarily displacement from skidding on steep soil slopes. Soil displacement is recovering with veg and duff cover. Unit has also been skyline/cable logged in past. In general unit appears to steep to tractor log without causing excessive DSCS. Mitigation: no mechanical decompaction oppertunities due to slope and soil rock content. Recommend WL or Cable/sky log and use existing open and closed roads to reduce risk of new DSCs.
157	6.5	11.5	16.5	21.5	Off Rd 070. Small unit with moderately deep loamy ash soils, undulating slope of 10 to 25%. Duff cover approx. 70-80%. Veg cover greater than 65%. High DWM, site susceptible to wind throw. Two or more historic harvests. More recent harvest than adjacent units 142 and 143. Skid trails obvious with associated detrimental soil compaction. Major skid trails and haul routes within unit. No erosion noted. Low mechanical decompaction opportunities due to variable soil depth and rock content and steep slope. Recommend WL or low PSI equipment, and use existing skid trails to reduce risk of new DSCs.
168	3.7	8.7	13.7	18.7	Off Rd 4650/ Rd 130/135. Mosaic of moderately deep to deep ash soils over fractured basalt. Dry Pipo/mixed conifer/Caru. Duff and veg cover greater than 65%. Minimum two historic harvests more recent selective harvest and Rxn burn associated with Lone Dog/Dog Fight timber sales, and pre-commercial thinning. Historically very large diameter Pipo removed resulting in soil displacement and compaction of skid trails that are naturally recovering. Low decompact opportunities due to variable soil rock depth and depth. Recommend use of existing skid trails and roads to reduce risk of new DSCs.
169	4.0	9.0	14.0	19.0	Off Rd 4650/ Rd 130/135. . Mosaic of moderately deep to deep ash capped soils over residual basalt soils and fractured basalt. Mixed conifer/Syal/Rose and pockets of very dry, open Pipo/Caru. Duff and veg cover greater than 65%. One to two historic harvests faint, recovering skid trails and some obvious skid trails with deep ruts and soil compaction. Comments/mitigation: NE lobe of unit has dense stand of conifer with dense snowberry and rose understory that will help mitigate new DSCs – it will also reduce potential for mechanical decompaction of skid trails.
170	3.8	8.8	13.8	18.8	Off Rd 4650/ Rd 130. Rd 130 shown on map as a closed road – but this road is currently used by ATV and vehicular traffic. Moderately deep to deep soils over residual basalt on moist undulating north east facing 5-15% slopes. Rock content variable. Mosaic of Pipo/Loac/Psme and other conifer/Syal/Snowberry/Caru. High amount of DWM. High ground cover. Two historic harvests and recent pre-commercial thin. Skid trails visible from newer harvests – and faint/recovering from older

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					harvests. No accelerated erosion noted. Some areas within unit look to have been cable/skyline logged. Moderate to low mechanical decompaction opportunities due to high Syal cover, and variable soil depth, rock and gradient. High shrub cover will help to mitigate new soil disturbance with proposed ground based activities.
171	3.8	8.8	13.8	18.8	Off Rd 4650/ Rd 130. Rd 130 shown on map as a closed road – but this road is currently used by ATV and vehicular traffic. Moderately deep ashy loam soils with very dry, open Pipo/Caru veg with open rocky meadows dispersed. Historic and recent select harvest activities resulted in faint skid trails with relatively minor ruts and compaction, all of which is recovering. Newest entry appears to have very low amount of new DSCs. Moderate to low mechanical decompaction opportunities due to variable soil depth, rock and gradient. High Caru root mat will help to mitigate new soil disturbance with proposed ground based activities.
173	5.0	10.0	15.0	20.0	Off Rd 4650. Several closed roads within unit. Moderately deep to deep ash capped soils. Moist site with Psme/Abgr. Developed spring within unit. Several historic harvests with both obvious and faint skid trails. Primary DSC is soil displacement/rutting of deep ash soils and some detrimental soil compaction. Much of the DSCs are recovering with veg and duff. Three significant closes roads run N/S off Rd 120. Mitigation/comments: Use of existing skid trails and closed roads to reduce risk of new DSCs. Moderate to high mechanical decompaction opportunities available if post- harvest condition warrant. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
174(S 1/2)	6.0	11.0	16.0	21.0	Off Rd 4650. North section of unit off Rd 120 is proposed for skyline logging. Developed Spring on western section south 1/2 of unit 174. Soils are deep ash, with greater than 90% duff cover, and high DWM. Highly stocked Psme/Loac/Abgr. Veg cover variable and low due to high overstory shading and duff. Two historic harvests with visible class 1 and 2 recovering skid trails. Trails with both soil displacement and compaction. Main skid trail runs N/S past pond. Moderate to high mechanical decompaction opportunities available if post- harvest condition warrant. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
176	4.9	9.9	14.9	19.9	Off Rd 4650/ Rd 120. Closed Rd in unit. Soils are deep ash, with greater than 80% duff cover, and high DWM. Site susceptible to wind throw. Highly stocked Psme/Loac. Very old, faint, random skid trails. Closed Rd within unit but used by ATV/vehicles. Use of existing skid trails and closed roads to reduce risk of new DSCs. Moderate to high mechanical decompaction opportunities available if post-harvest condition warrant.
177	5.1	10.1	15.1	20.1	Soils are moderately deep to deep ash, with greater than 80% duff cover (less than 1 inch thick), and

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					high DWM. Site susceptible to wind throw. Pond/fenced spring within unit. High amount of animal trailing. Mixed conifer primarily Psme/Abgr associated with deep ash soils. Pipo associated with shallower soils. Two historic harvests. Skid trails obvious with primarily soil displacement/rutting recovering with veg and duff cover. Majority of skid trails on north lobe – less obvious skid trails on south lobe, but tie into Rd 150. Moderate to high mechanical decompaction opportunities available if post- harvest condition warrant, particularly on norther section of unit. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
178	4.5	9.5	14.5	19.5	Off Rds 4650 + 150. Road 150 and closed road cut through unit. Site is dry with mosaic of loamy ash and mixed residual basalt/ ash soils. Rock cover and content are variable throughout. Veg type is dry Pipo/Mixed conifer. Two historic select harvests with large diameter Pipo removed. Soil disturbance is primarily soil displacement and rutting associated with random skid trails. Soil compaction associated with main skid trails – surface soil compaction recovering. Moderate to low mechanical decompaction opportunities due to variable soil depth. Use existing skid trails and roads to extent possible to reduce risk of new DSCs.
182 + 183	19.0	24.0	29.0	34.0	Off Rds 4615/ Rd 250. These sites were combined to facilitate soil survey. However, soil, veg types and soil conditions vary throughout unit. Soils are generally shallow to moderately deep ashy loam with varying amounts of gravel and cobble soil content. Surface rock varies from 0 to 30% cover. Soils associated with unit 182 tend to be deeper with higher ash content. Site is generally a dry Pipo/Fied with increasing Psme. Many historic harvests throughout proposed units. High disturbance associated with select harvest of large diameter Pipo. Skid trails are both faint and obvious – however soil compaction is quite sever throughout the unit independent of how obvious the skid trail appears (See photo). High amount of gopher activity on skid trails. Animal trails common throughout unit. Comments/mitigation: Recommend using skid trails to extent possible. Winter logging and/or use of low PSI may help reduce risk of new DSCs. Shallow mechanical decompaction of old DSC suggested.
184	9.7	14.7	19.7	24.7	Off Rd 4615/ 205 and 160. Shallow to moderately deep gravely ashy loam soil on undulating slopes of 5 to 15%. Very dry Pipo/Caru/Fied. Old and newer soil disturbance. Most DSCs associated with older/ recovering soil compaction on random skid trails and obvious historic major skid trails/haul routes from historic harvest large diameter Pipo. Newer harvests (bug Check #13) appear to be associated primarily with non-detrimental soil disturbance with duff and veg left intact. Mitigation/Comments: High current DSCs from historic logging. Animal trailing much lower concern than in adjacent units 183/184. Use of existing skid trails, closed roads and open roads may reduce risk of new DSCs. Mechanical decompaction not recommended due to shallow and rocky soils. Recommend winter

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					logging or use of Low PSI and full suspension of logs.
185	12.7	17.7	22.7	27.7	Off Rds 4615/ 200. Shallow to moderately deep gravely and cobbly ashy loam over silty clay loam/residual basalt. Dry Pipo/Feid. Duff and veg cover greater than 65% - but duff very thin due to recent Rxn burn. Several historic select harvests. Large diameter Pipo removed. Skid trails common throughout in random pattern. Soil compaction primary DSC and high in extent and degree. Clayey soils appear to harden with combination of both soil dryness and moderate levels of compaction. Most recent harvest was Bug Check and Rxn burn leaving open stand of Pipo and lower than expected soil cover. Comments: No mechanical decompaction recommended due to shallow rocky soils. Use of Low PSI or WL to reduce risk of new DSCs. Is this a priority unit?
186	14.7	19.7	24.7	29.7	Off Rd 4615/ 095. Mosaic of shallow to moderately deep and deep, gravely loamy ash soil on undulating slopes of 5 to 20%. Soils drier and rockier on ridge tops and deeper with less rock by content on toe slopes and draw bottoms. Very dry Pipo/Caru/Fied. Duff and veg cover greater than 65% - but duff very thin due to recent harvests and Rxn burn. Old and newer soil disturbance. Most DSCs associated with older soil compaction on random skid trails and obvious historic major skid trails/haul routes from historic harvest large diameter Pipo. Newer harvests associated primarily with detrimental soil compaction on skid trails and landings on toe slopes and adjacent to draw bottoms. Degree and severity of soil compaction is high throughout unit – very little natural recovery noted. A large developed pond is adjacent to unit. High amount of animal trailing and detrimental soil impacts. Mitigation/Comments: High current DSCs from historic and more recent logging. Animal Use of existing skid trails, closed roads and open roads may reduce risk of new DSCs. Mechanical decompaction not recommended due to shallow and rocky soils. Recommend winter logging or use of Low PSI and full suspension of logs. Low to moderate mechanical decompaction opportunities – but recommend shallow decompaction of severely compacted areas adjacent to draw bottom, landings and major skid trails. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
200	6.6	11.6	16.6	21.6	Off Rd 4605. Closed road dissects unit. Closed road currently used by ATV and vehicles. Shallow to moderately deep, very cobbly ashy loam on rocky Knob. Soil cobble decreases and soil depth increases to north end of unit. Slope ranges from 5 to 20%. Very dry Pipo/Feid. Appears highly stocked for such a droughty soil. Two historic harvests, plus recent pre-commercial thin. Skid trails faint. Majority of skid trails are on north end of unit, below closed road. Mitigation/comments: Droughty soil and high stocking = water stress. Use of closed road, and high soil rock content may mitigate new DSC. No mechanical decompaction opportunities due to shallow rocky soils.

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202	4.4	9.4	14.4	19.4	Off Rd 4605. Soils mosaic of shallow, moderately deep and deep gravely, residual basalt soils and gravely ashy loam on undulating topography with 5 to 40 % slope. Soils drier and rockier on ridge tops and deeper with less rock by content on toe slopes. Veg group is a dry Pipo/Caru/Snowberry with increased amount of Psme on toe slopes with deeper, moister soils. Two historic harvests, Bug Check most recent. Skid trails are faint and tend to be perpendicular to road. They are associated with minor displacement and compaction. Closed road within unit currently used by ATV and vehicles. Mitigation/comments: Use of closed road, and high soil rock content may mitigate new DSC. No mechanical decompaction opportunities due to shallow rocky soils.
212	7.7	12.7	17.7	22.7	Off Rd 4605 +074. Moderately deep to deep gravely, ashy loam colluvium soil on undulating topography with 5 to 40% slopes. Steeper slopes adjacent to draw. Plant group is mixed conifer/Psme/Popo/Loac/ Caru/ ninebark/ Feid. One historic harvest plus pre-commercial thin. Skid trails generally perpendicular to roads within unit. Low severity and extent of soil disturbance associated with skid trails. Mitigation/comments: Steep colluvium soils will displace easily with ground based logging on steep slopes.
214	6.0	11.0	16.0	21.0	On east side of Swamp Creek. Moderately deep to deep gravely, ashy loam colluvium soil on undulating topography with 5 to 25 to 50% slopes. Veg and duff cover greater than 65%. Mixed conifer/ Pipo/Psme/Loac and high stocking of Pico on alluvial outwash areas. One to two historic harvests. Sky bob unit marked – but not cut. Skid trails both perpendicular and parallel to closed road. Primary DSCs is soil compaction, recovering naturally with surface decompaction. Veg and duff cover. This road currently used by both ATV and vehicle traffic. Mitigation/comments: Steep colluvium soils will displace easily with ground based logging on steep slopes. Use of closed road, and high soil rock content may mitigate new DSC. Low to moderate mechanical decompaction opportunities on toe slopes only of post- harvest conditions warrant.
215	5.6	10.6	15.6	20.6	On east side of Swamp Creek. Soils moderately deep to deep gravely ash on undulating topography with 5 to 25% slopes. Soils moister than unit 114. Pipo/Psme/Loac and high stocking of Pico on alluvial outwash areas. Similar harvest history as unit 214. Sky bob unit marked – but not cut. Skid trails generally parallel to closed road, associated with recovering soil compaction and displacement. Mitigation/comments: Steep colluvium soils will displace easily with ground based logging on steep slopes. Use of closed road, and high soil rock content may mitigate new DSC. Low to moderate mechanical decompaction on toe slopes only of post- harvest conditions warrant.
229A	8.0	13.0	18.0	23.0	On east side of Swamp Creek. Soil moderately deep to deep ash cap over ashy loam/residual basalt on west facing slope ranging from 5-13%. Mixed conifer/ Pipo/Pico/Loac. Duff and veg cover greater

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					than 65%. Historic select harvest of very large diameter Loac and Pipo. Many obvious skid trails associated with both soil compaction and displacement. Historic soil displacement is recovering with veg and duff cover. Skid trails concentrated on lower 1/3 of unit adjacent to closed road on west side of unit. Closed road currently used. Mitigation/ comments: Use existing skid trails and roads to extent possible to reduce risk of new DSCs. Moderate to high mechanical decompaction opportunity, particularly on historic compaction of skid trails adjacent to closed road.
229B	9.8	14.8	19.8	24.8	Small isolated unit on west side of Swamp Creek and adjacent to private land. Soil moderately deep to deep ash cap over ashy loam/residual basalt on west facing slope ranging from 5-13%. Mixed conifer/ Pipo/Psme/Caru. Duff and veg cover greater than 65 to 80%. Historic select harvest of very large diameter Pipo. Many obvious skid trails perpendicular to road associated with both soil compaction and displacement. Historic soil displacement is recovering with veg and duff cover. Historic soil compaction is recovering on top 2 inches soil depth and with veg and duff cover. Mitigation/ comments: Use existing skid trails and roads to extent possible to reduce risk of new DSCs. Moderate to high mechanical decompaction opportunity, particularly on historic compaction of skid trails adjacent to and perpendicular to road.
233	10.8	15.8	20.8	25.8	Off Highway 3 and closed Rd 410. South ¾ of unit is shallow to moderately deep, rocky residual basalt soils/loamy ash mixed with very dry Pipo/Caru/Feid vegetation. North ¼ unit moderately deep to deep ash capped with Pipo/Mixed conifer. High amount of soil disturbances attributed to multiple uses. Minimum of two historic harvests. Multiple roads within unit – some FS system roads labeled as closed – several non-FS system roads. All roads within unit currently being used, main road used to access adjacent private land. Primary DSCs from historic harvests is soil displacement associated with dispersed skid trails, and soil compaction associated with temp roads, dispersed recreation, landings and animal trailing/ grazing activities. Mitigation/ comments: Use existing skid trails and roads to extent possible to reduce risk of new DSCs. High surface rock and rock content of soils on southern end of unit will help reduce risk of new DSCs. Low to moderate mechanical decompaction opportunity on historic compaction of skid trails and landings adjacent to closed road, and on north ¼ of unit. Recommend mitigation of post activity animal trailing and dispersed recreation/wood cutting/camping on skid trails and areas mechanically decompacted to reduce cumulative detrimental soil effects in this unit.
234	8.6	13.6	18.6	23.6	Off Highway 3 and closed Rd 410. Small isolated unit on break of Canyonlands. Soils moderately deep, gravely, silty clay loam with both surface and subsurface cobbles. Primary soil disturbance is historic soil displacement that is recovering. North east section of unit with deeper pure ash soils and

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					higher amount of DSCs, both displacement and compaction. This section of road 410 is not currently used. Animal trailing along fence adjacent to unit. Mitigation/comments: Use existing skid trails and roads to extent possible to reduce risk of new DSCs. Recommend winter logging or use of Low PSI equipment. Low mechanical decompaction opportunities. Recommend mitigation of post activity animal trailing on skid trails to reduce cumulative detrimental soil effects in this unit.
236	8.3	13.3	18.3	23.3	Off Highway 3. Very small unit with moderately deep to deep ash capped soils with high duff and veg cover. Over stocked PSME/Loac. High amount of DWM. Site susceptible to wind throw. Majority of historic DSCs is soil displacement – recovering with vegetation and duff cover. Very little detrimental soil compaction. Mitigation/comments: soils highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Mechanical decompacting not advised – will not improve current amount of DSCs attributed primarily to soil displacement.
240	6.6	11.6	16.6	21.6	Off Highway 3. Small section of unit proposed for ground based logging. Deep ash capped soils with high duff and veg cover. Over stocked Psme/Abgr. High duff cover and high amount of DWM. Site susceptible to wind throw. Majority of historic DSCs is soil displacement – recovering with vegetation and duff cover. Very little detrimental soil compaction. Mitigation/comments: soils highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Mechanical decompacting not advised – will not improve current amount of DSCs attributed primarily to soil displacement.
246A	7.2	12.2	17.2	22.2	Off Swamp Creek Road -Just S of Cow Camp. Moderately deep to deep gravely and cobbly ashy loam over residual basalt soils on 5 to greater than 15% slope. Pipo/Psme/Pien/Abgr/Caru. Veg and duff cover greater than 65%. High amount of DWM, site susceptible to wind throw. High amount of historic soil disturbance. Soil displacement common throughout is recovering with duff and vegetation cover. Soil compaction is recovering to depth of 3 inches top soil – but platy soil is evident below 3 inches. Mitigation/comments: soils highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Moderate mechanical decompacting opportunities on historic detrimental soil compaction.
246B	7.6	12.6	17.6	22.6	Off Swamp Creek Road -Just S of 246A. Soils similar to 246A. Moderately deep to deep gravely and cobbly ashy loam over residual basalt soils on 5 to greater than 15% slope. Mixed confer with greater amount of large diameter Pipo. Also, soils become droughty to south end of unit. Veg and duff cover greater than 65%. High amount of historic soil disturbance. Soil displacement and rutting up to 20 inches deep common throughout is recovering with duff and vegetation cover. Soil compaction is recovering to depth of 3 inches top soil – but platy soil is evident below 3 inches.

Unit	Total Class 2 and 3 DSCs without FS Roads (%)	Total Existing Class 2 and 3 DSCs with 5% FS Roads (%)	Expected Total DSCs without FS Roads (%) (assumed 10% new)	Expected Total DSCs Including FS Roads (%) (Assumed 10% new)	Comments : Location, Soil Type, plant community, historic logging and soil impacts, suggested mitigations or restoration
					Mitigation/comments: soils highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Moderate mechanical decompacting opportunities on historic detrimental soil compaction.
262	7.0	12.0	17.0	22.0	Off Swamp Creek Road. Very large unit with moderately deep to deep gravely and cobbly ashy loam over residual basalt soils on undulating topography with 5 to greater than 10% slope. Pipo/Psme/Pien/Abgr/Caru. Veg and duff cover greater than 65%. High DWM. High amount of historic soil disturbance. Loac associated with deeper ash capped soils on south 1/3 of unit. Soil displacement and rutting common throughout is recovering with duff and vegetation cover. Soil compaction is recovering to depth of 0-2 inches top soil – but platy soil is evident below 2 inches. Greatest amount DSC on south end unit. North ½ of unit has blue marked trees that have not been cut. Many small e-draws run W/E toward road. Alluvial terraces of pure ash soils are associated with draw mouths and where slope decreased to less than 5%. Mitigation/comments: Ash capped soils highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Moderate mechanical decompacting opportunities on historic detrimental soil compaction, but will be difficult due to variable rock content throughout unit and presence of numerous draws that dissect unit from west to east. ***Caution: old barbed wire fence, half buried, running north to south approximately 300 feet above and parallel to road.***
265	5.0	10.0	15.0	20.0	Just east of Highway 3, off Rd 4602/ Rd 105, Highly variable unit ranging from droughty, shallow rocky soils to deep, moist, ash capped soils and undulating topography ranging from 5 to greater than 45% slope. Pipo/Caru vegetation associated with dryer, shallower, rockier soils on low gradient slopes. Abgr/Loac/Abgr associated with deeper, moister soils within e-draws and steeper slopes. Skid trails visible on terrain with gradient less than 25%. Primary soil disturbance is soil displacement – recovering with veg and duff cover. Mitigation/comments: Ash capped soils on steeper slopes is highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Low mechanical decompacting opportunities due to variable rock content, undulating topography, slope and e-draw.
273	5.2	10.2	15.2	20.2	Just east of Highway 3, Off Rds 4602 /105. This unit was difficult to survey due to steep, undulating slopes of greater than 35 – 40% and high density of Abgr saplings. Survey consisted of 5 small transects off of road 105 – and focused on areas with obvious skid trails. Highly variable unit ranging from droughty, shallow rocky soils on the north half to deeper soils on very steep gradient on south half of unit. Overall, undulating topography ranging from 5 to greater than 45% slope. Pipo/Caru vegetation associated with dryer, shallower, rockier soils on low gradient slopes. Abgr/Loac/Abgr

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					associated with deeper, moister soils within e-draws and steeper slopes. Skid trails visible on terrain with gradient less than 25%. Primary soil disturbance is soil compaction, but difficult to see due to high sapling density. Mitigation/comments: Ash capped soils on steeper slopes is highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Low mechanical decompacting opportunities due to variable rock content, undulating topography, slope and e-draw.
274	9.0	14.0	19.0	24.0	Just east of Highway 3, Off Rds 4602 and 040 / 105. Road 105 closed – very steep cut banks, with saplings and other thick vegetation in some areas. This unit has soils and vegetation similar to unit 273, but less density of saplings. Highly variable unit ranging from droughty, shallow rocky, gravely soils to deep, moist, ash capped soils and undulating topography ranging from 5 to greater than 25% slope. Pipo/Caru vegetation associated with dryer, shallower, rockier soils on low gradient slopes. Abgr/Loac/Abgr associated with deeper, moister soils in draws and on steeper slopes in central part of unit. Primary soil disturbance is soil compaction, and secondary is displacement on steeper slopes. Skid trails on shallower, rocky soils have high amount of gopher activity, and higher than expected bare ground. Generally, historic soil disturbance is recovering with veg and duff cover. Mitigation/comments: Ash capped soils on steeper slopes is highly susceptible to displacement and soil compaction. Use Low PSI, and existing skid trails to reduce risk of new DSCs. Low mechanical decompacting opportunities due to variable rock content, undulating topography, slope and e-draw. Assess re-contouring/rehabilitation of road 105 and road 040 to reduce DSCs.
276	4.9	9.9	14.9	19.9	Off Rds 4602/ 080 + 120. Road 080 dissects entire unit. Mosaic of dry, shallow, moderately deep to deep gravely and rocky ashy loam soils with rock outcrop in some areas. Undulating topography with 15 – 25% west facing slope. Veg and duff greater than 65%. Pipo/Pico/Caru/Feid. Faint skid trails associated with scattered, detrimental soil compaction, and soil displacement/ ruts that are recovering with veg and duff cover. Major historic skid trail up draw. Mitigation/comments: Surface rock and thick grass mat appear to have helped mitigate new DSCs with most recent TS (Roberts). Use Low PSI, and existing skid trails to reduce risk of new DSCs. Low mechanical decompacting opportunities due to variable rock content, undulating topography, slope and e-draw.
280	6.1	11.1	16.1	21.1	Off Rds 4602/ 080. Unit 276 and unit 280 similar soil types and veg types. Mosaic of dry, shallow, moderately deep to deep gravely and rocky ashy loam soils. Undulating topography with 15 – 25% west facing slope. Forested sections of unit surrounded by dry, rocky open meadows. Veg and duff greater than 65%. Pipo/Psme/Caru/Feid. Historic harvest of very large diameter Pipo. Faint, random skid trails associated with scattered, detrimental soil compaction, and soil displacement/ ruts that are

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					recovering with veg and duff cover. Rxn burning with most recent TS (Roberts). Mitigation/comments: Surface rock and thick grass mat appear to have helped mitigate new DSCs with most recent TS (Roberts). Use Low PSI, and existing skid trails to reduce risk of new DSCs. Low mechanical decompacting opportunities due to variable rock content, undulating topography, slope and e-draw.
285	10.0	15.0	20.0	25.0	Off Rd 46 and Rd 023. Soils variable, but generally moderately deep ash to deep ash over basalt. Dry Pipo/Syal to moister Psme/Abgr/Caru/Vame. Greater than 65% duff and veg cover. Duff layer thin. High amount DWM. Multiple historic harvests and skid trail patterns, but primarily perpendicular to Rd 46. Soil disturbance is very high and obvious – particularly immediately adjacent to Rd 46. Detrimental soil rutting/displacement is common throughout, but recovering with veg and duff cover. Detrimental soil compaction is common throughout and only minimally recovering naturally. Mitigation/comments: Use Low PSI, and existing skid trails and roads to reduce risk of new DSCs. Moderate to good mechanical decompacting opportunities on deeper soils with low slope gradient.
286	14.8	19.8	24.8	29.8	Off Rd 46 and Rd 020/023. Soils, veg groups and site conditions vary greatly across unit 286. Several roads located in unit. Soils are loamy ash on north east section, and change to cobbly, ashy silty clay loam as move south and west. Vegetation is a mosaic across unit; Abgr/Psme/Pipo and associated with soil type and depth. Duff and veg cover vary from less than 45% to greater than 65%. Area associated with T2 on plateau top with 0-10% slope associated with very dry Pipo/Syal. This area also has many uncut blue marked trees (see photos). Several different historic harvests, some old with high amount of DSCs, some newer with minor amounts of DSCs. Soil compaction is primary DSC. Some natural recover of soil compaction. Good recovery of historic detrimental soil displacement with veg and duff. Mitigation/comments: Use Low PSI, and existing skid trails and roads to reduce risk of new DSCs. Moderate mechanical decompacting opportunities on deeper soils with low slope gradient. Suggest using caution and testing soil depth and rock content before implementing mechanical decompaction activities.
287	6.3	11.3	16.3	21.3	Loamy ash soils with mosaic of old Pipo and smaller diameter Psme/Caru veg group. Greater than 65% veg and duff cover. Soils moderately deep to shallow adjacent to open meadow edges. Skid trails random, but visible. Old roads visible within unit, currently still used by ATV and vehicles. Mitigation/comments: Use Low PSI, and existing skid trails and roads to reduce risk of new DSCs. Moderate mechanical, shallow decompacting opportunities on deeper soils particularly on center to north half of unit where associated with "Fair" timber sale - if post-harvest conditions warrant.
292	4.5	9.5	14.5	19.5	Off Rd 4650/ Rd 060. Mosaic of moderately deep to over residual basalt on slope ranging from 0 to

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					20%. Open, dry Pipo with Loac/Pipo with Psme/Abgr understory at head of draw. Skid trails are visible, dispersed, primarily with compaction that recovering. Open Pipo with less amount of DSC as compared with moister soils associated with draw. Unit is adjacent to Lone Dog 11. Low mechanical decompaction opportunities due to low current DSCs and variable soil depth, rock content and slope.
294	8.8	13.8	18.8	23.8	East of Swamp Creek Rd. Soils on north half of unit are deep gravelly ash on 0 – 15% east facing slope – undulating topography. South half unit soils are ashy / silty clay loam. Spring located on S ½ of unit. Vegetation is Pipo/Psme/Caru/Snowberry. 1 to 2 historic harvests obvious. Skid trails are both faint and obvious, and both perpendicular and parallel to roads. Much of historic ruts/displacement and compaction is recovering with veg and duff cover which is greater than 65% cover throughout unit. Soil compaction associated with skid trails is recovering on top 3" of soil depth, but soils remain severely compacted below that depth. Some skid trails "ripped" in past, but appear ineffective and caused soils and vegetation to appear "hummocky". Mitigation/ comments: Use low PSI ground based equipment to reduce risk of new DSCs or winter log. Soils can be mechanically decompacted if post-harvest conditions warrant.
300	6.4	11.4	16.4	21.4	Off Rd 46/ Rd 300. Small unit with very shallow to shallow, dry, rocky residual/ ash mixed soils. Open, dry Pipo/ Feid. Two historic harvests. Random skid trails, both faint and obvious. Soil compaction is primary DSCs. Animal trailing throughout unit. Comments/ Mitigation: Surface rock content may reduce risk of new DSC if ground based harvesting occurs under dry conditions. Clayey soils at risk of soil puddling and compaction if ground based equipment used under moist conditions. Use Low PSI equipment to reduce risk of new DSCs. Low to no mechanical decompaction opportunities due to shallow, rocky soils.
303	9.7	14.7	19.7	24.7	Off Rd 46/ Rd 352. Soils are variable, ranging from moderately deep to deep ashy loam, located on undulating topography ranging from 0 – 25% slope. Veg and duff cover is greater than 65%. Dry Pipo/Feid. Appears only one historic harvest activity. Large Pipo removal associated with large, skid trails and detrimental soil compaction and displacement. Some soil compaction and displacement is recovering naturally and has good vegetation and duff cover. Non system road located within unit. Mitigation/Comments: Soils are susceptible to soil displacement, especially on steeper slopes. Suggest using Low PSI equipment and /or winter log to reduce risk of new DSCS. Minimum mechanical decompaction opportunities due to undulating slope, and soils with high displacement potential.
306	2.0	7.0	12.0	17.0	Off Rd 4602/ Rd 040. The majority of this unit is proposed for Skyline/cable logging. A very small section was proposed for ground based logging. DSCs survey estimated less than 2% DSCs – therefore a low concern unit. Unit is similar to Unit 274. Soils are moderately deep to deep, rocky, ashy loam.

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					Veg is dry Pipo/Psme. Mitigation/Comments: Soils will displace and compact easily due to ash content. Use low PSI. Low mechanical decompaction opportunities due to variable soil depth and rock content.